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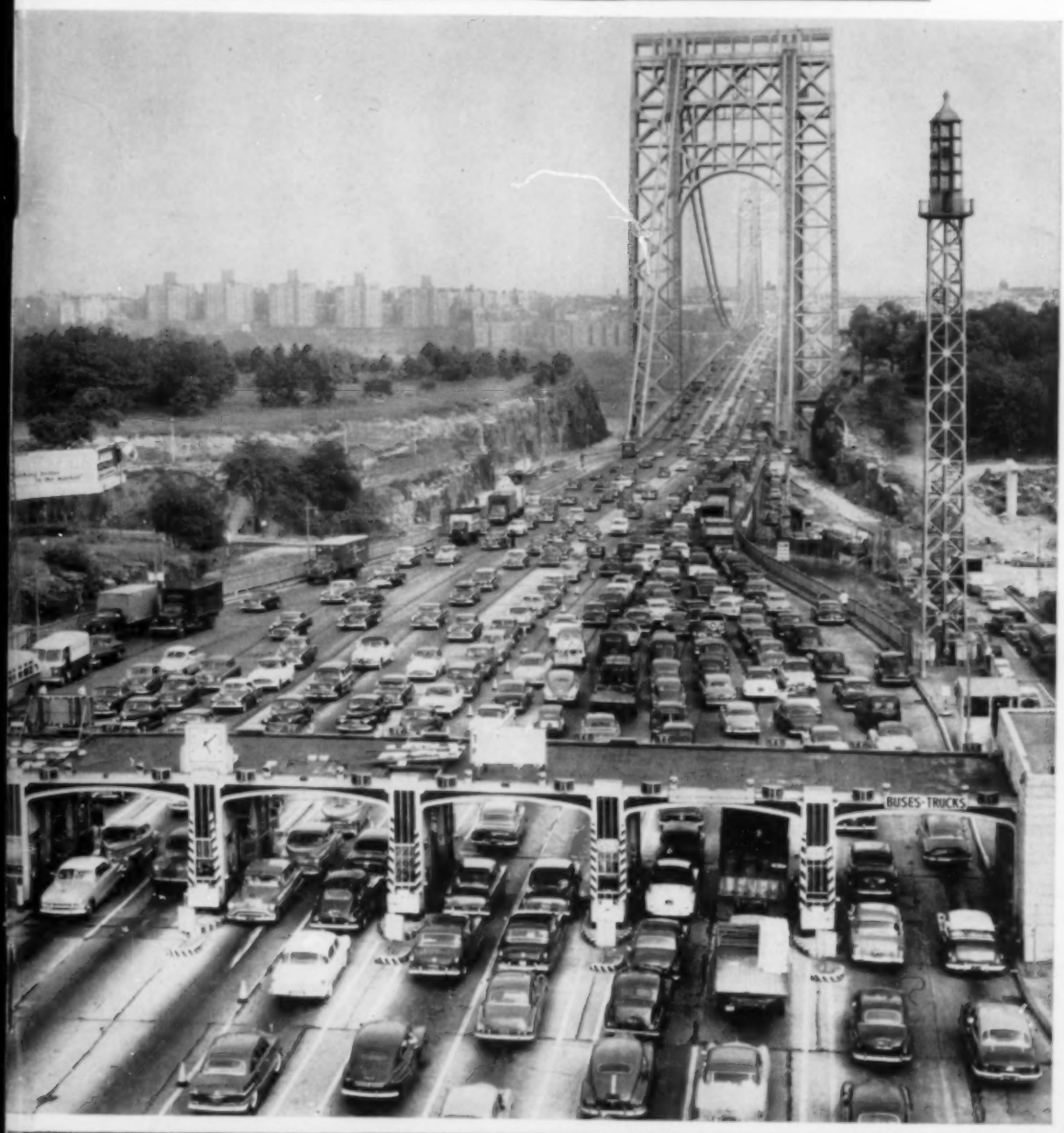


DEVANEY PHOTO

RETURN OF THE SUNDAY DRIVERS

Traffic congestion at New Jersey end of George Washington Bridge

VOLUME 59 • NUMBER 9 NEW YORK • LONDON

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

COPPUS

BLUE RIBBON BLOWERS

THE BLOWERS THAT PUT MORE MINUTES IN EVERY MAN-HOUR

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 209 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

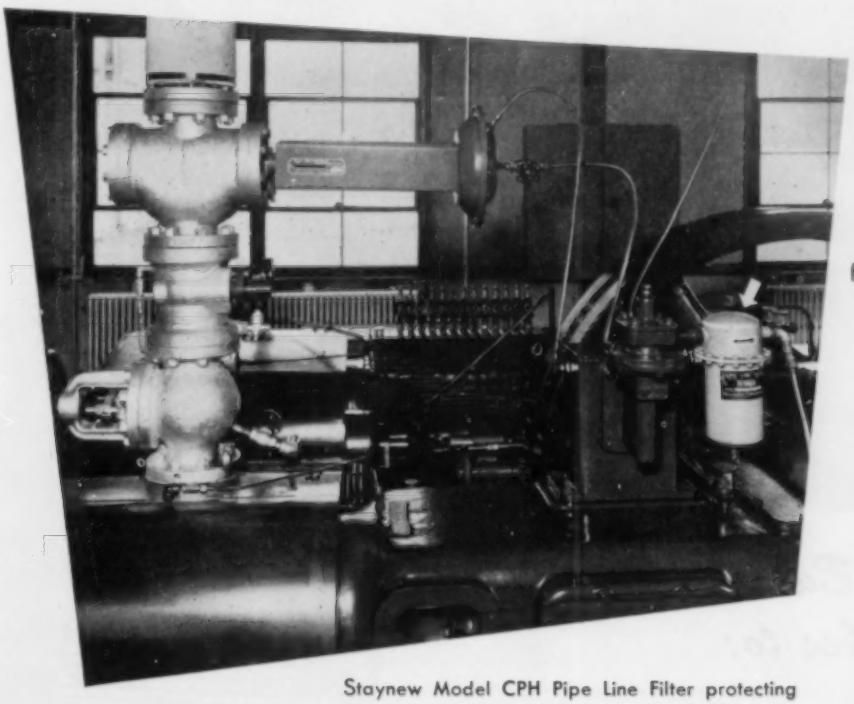
CITY .....

(Write here any special ventilating problem you may have.)

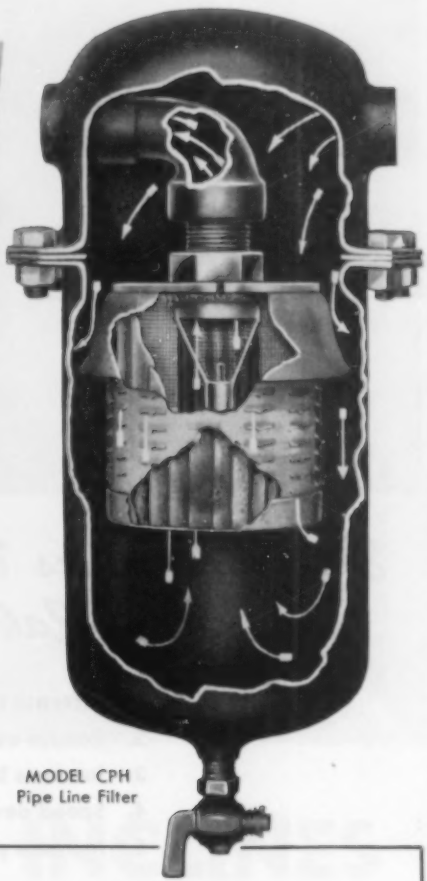
Circle 1A on reply card

STAYNEW PIPE LINE FILTERS

HELP KEEP THE PLANT OPERATING GROUP HAPPY



Staynew Model CPH Pipe Line Filter protecting throttling governor on Ingersoll-Rand XPV compressor at Long Island Lighting Co., Riverhead, L. I.



MODEL CPH
Pipe Line Filter

Failure to provide proper filtration can cause delays and breakdowns due to accumulation of rust, scale, foreign particles and condensed oil in pipe lines. This disrupts the cycle of production resulting in lost time and damaged materials.

Due to sound engineering design and construction, Staynew Pipe Line Filters give dependable day in and day out performance with minimum of maintenance . . . prolong the life of your equipment and help keep the plant operating group happy.

For quick action let our Engineering Department help solve your filtration problems. Write today for Bulletin B-1A.

USED ESPECIALLY FOR

- AIR OPERATED INSTRUMENTS
- AIR OPERATED TOOLS
- PNEUMATIC CONTROLS
- INDUSTRIAL PROCESSES

Representatives in principal cities.

DOLLINGER PROTECTOMOTOR REG. U.S. PAT. OFF. STAYNEW FILTERS

DOLLINGER CORPORATION

7 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

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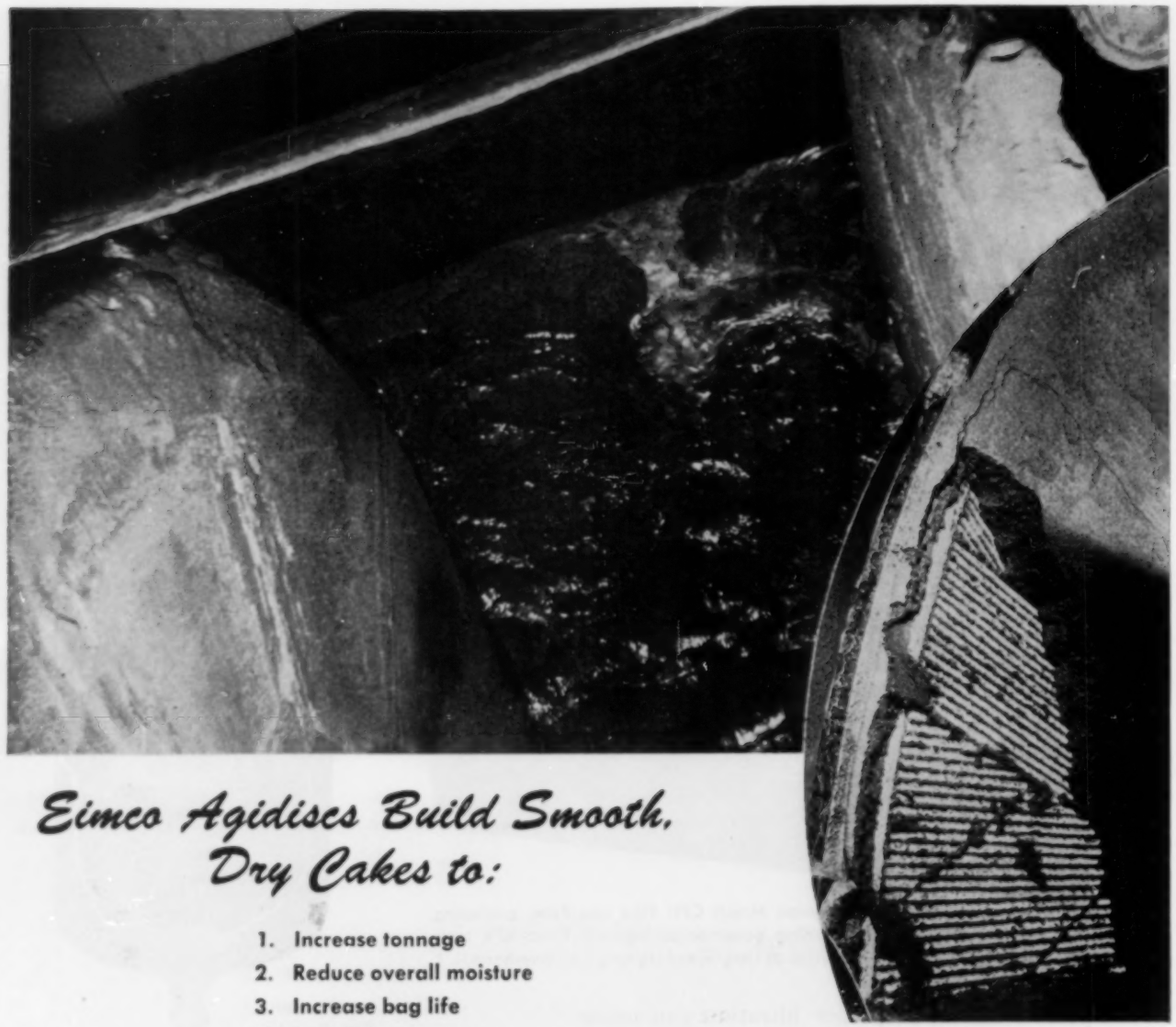


Eimco Agidiscs Build Smooth, Dry Cakes to:

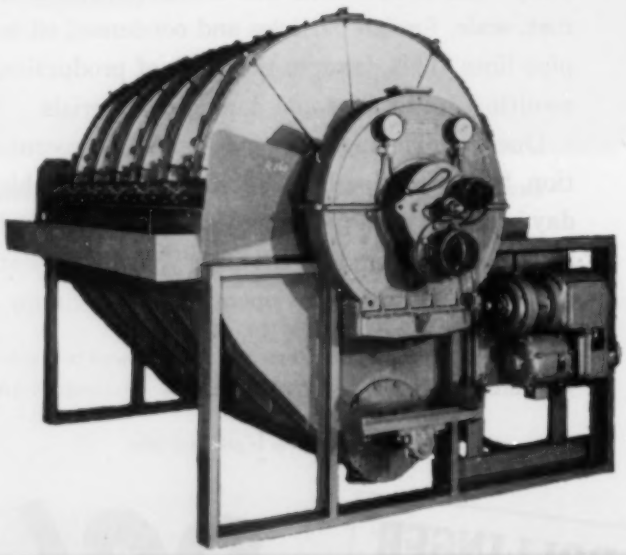
1. Increase tonnage
2. Reduce overall moisture
3. Increase bag life
4. Speed dewatering
5. Increase profits

Fast settling solids in metallurgical slurries are easily kept suspended in solution by the gentle agitating motion of the Eimco Agidisc filter.

This action, in the filter, evenly distributes all particles, regardless of size, so that the entire surface of the disc is covered with a cake of even thickness. Cake thus formed may be dewatered and dried uniformly so that there are no real wet spots or dry spots.

Metallurgical plants using Eimco Agidisc filters are enjoying greater capacity per square foot of filter area per hour (20% better) and lower moisture content in the cake.

Let an Eimco Engineer tell you how the Agidisc works. Whether or not it will make more money for you.



THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

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FAST LOADING ON INCLINES

Speed up sinking on inclined shafts by using Eimco RockerShovels with patented snubber attachments for digging on steep grades (maximum 45 degrees).

Special equipment on the Eimco machine is assembled at the factory which assures the proper angle of step plate and proper elements to make the loader stay on the track and to assure the user of a full load in the car.

Eimco incline loading machines save many times their price in sinking inclines that are only a few hundred feet long. Any Eimco used for slope loading can be easily converted to standard design for loading on the level.

Eimco has no yearly models, but is constantly adding new improvements to all Eimco machines. The revised machine is sold as the same model number at no increase in price giving you the advantages of a vastly improved machine with greater dependability, greater efficiency and greater saving per ton loaded.

Write for further information.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

You Can't Beat An Eimco!

B66

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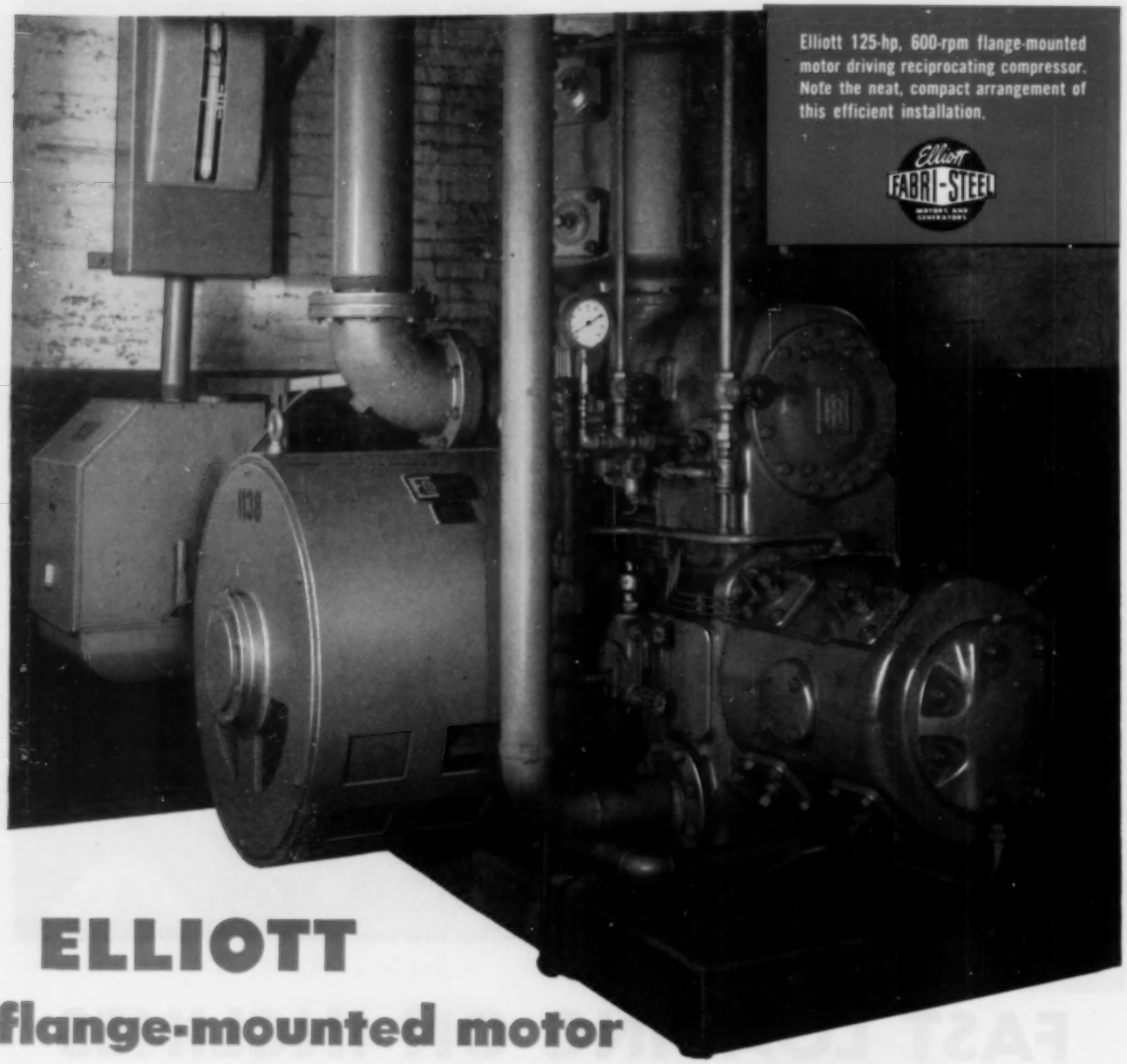


Elliott 125-hp, 600-rpm flange-mounted motor driving reciprocating compressor. Note the neat, compact arrangement of this efficient installation.

Elliott FABRI-STEEL MOTORS AND GENERATORS

ELLIOTT

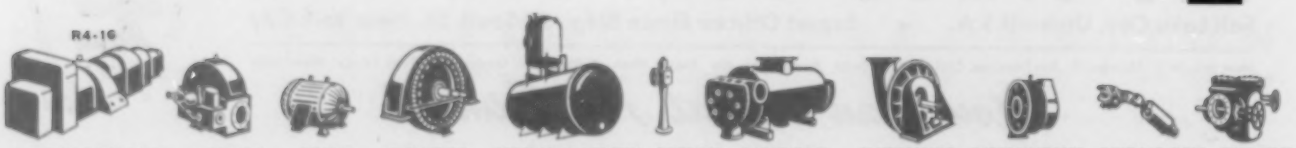
flange-mounted motor for reciprocating compressors

COMPACTNESS AND ECONOMY of installation makes this motor-driven compressor unit a neat "package" on any floor. The Elliott motor, a vital element in this unit, requires a minimum of space with the motor stator mounted on a flange bracket on the side of the compressor frame and the motor rotor mounted directly on an extension of the compressor shaft. Elliott motors are available for this type of installation as squirrel-cage induction motors and either unity powerfactor or .8 PF leading synchronous motors in ratings of 125 and 150 hp at 600 rpm and 200 and 250 hp at 514 rpm.

Excellent design and careful workmanship make this Elliott motor a worthy teammate for your compressor. Insulation, the key to long motor life, is given very special attention. The finest materials are selected, and they are applied by experienced craftsmen. In addition, Elliott will supply any make of control requested and *provide a completely coordinated motor, control and exciter combination.* For complete technical details, write Elliott Company, Ridgway Division, Ridgway, Pa.

ELLIOTT Company

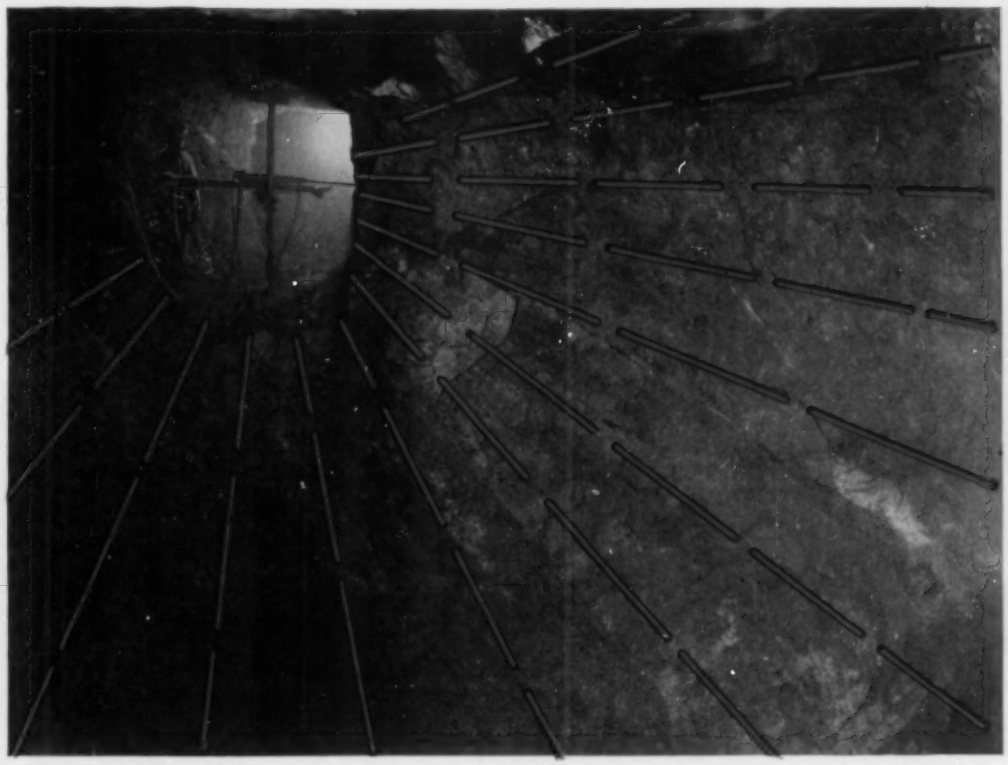
R4-16

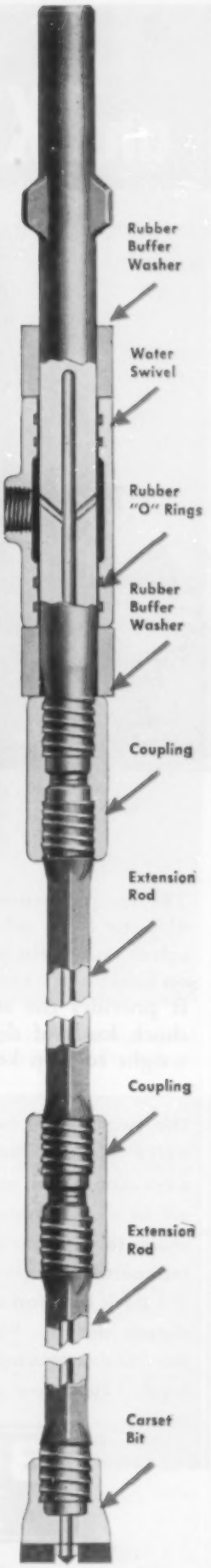


TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

Circle 5A on reply card

make short work of
LONG HOLE DRILLING





From bit to compressor, Ingersoll-Rand supplies everything you need for faster, more-efficient long-hole drilling

Holes up to 100 feet deep are now being drilled easily and quickly by the Ingersoll-Rand Carset method. Longer-lasting, faster-drilling Carset Jack-bits when used with I-R Drifters, water swivels and coupled alloy steels, have proved both *faster* and *less costly* than diamond drilling.

The Ingersoll-Rand *complete line* of long hole equipment includes a proven water swivel that feeds air and water directly into the drill steel at high pressure without going through the drill. This plus an improved heavy-duty coupling, with the same threads as the bit, and high-strength alloy steel extension rods, gives you a remarkably successful drilling combination.

Ask your I-R representative for the whole cost-saving story. He can supply everything you need—from the bit back to the compressor.

5-88

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

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an EXTRA MARGIN of Strength

without Excess Weight

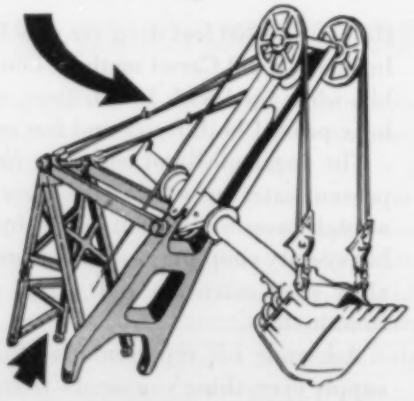
The unique two-section boom used on Bucyrus-Erie 4½- to 8-cu. yd. Ward Leonard electric shovels solves one of the problems of front-end construction on heavy-duty excavators in a sound, practical way. It provides the strength needed to withstand the shock loads of digging, yet is remarkably light in weight to help keep swing inertia low.

The two-section boom is only one example of *that extra margin* built into Bucyrus-Erie heavy-duty excavators—an extra margin in design *that pays off in extra loads and more output*. There's much more to the story—the tubular dipper handle, the independent rope crowd, the twin dual hoist ropes, the deck location of crowd machinery, the improved dipper design. Write for complete information on the model of your choice—the 4½-yd. 110-B, the 6-yd. 150-B, and the 8-yd. 190-B. 18L54

BUCYRUS ERIE

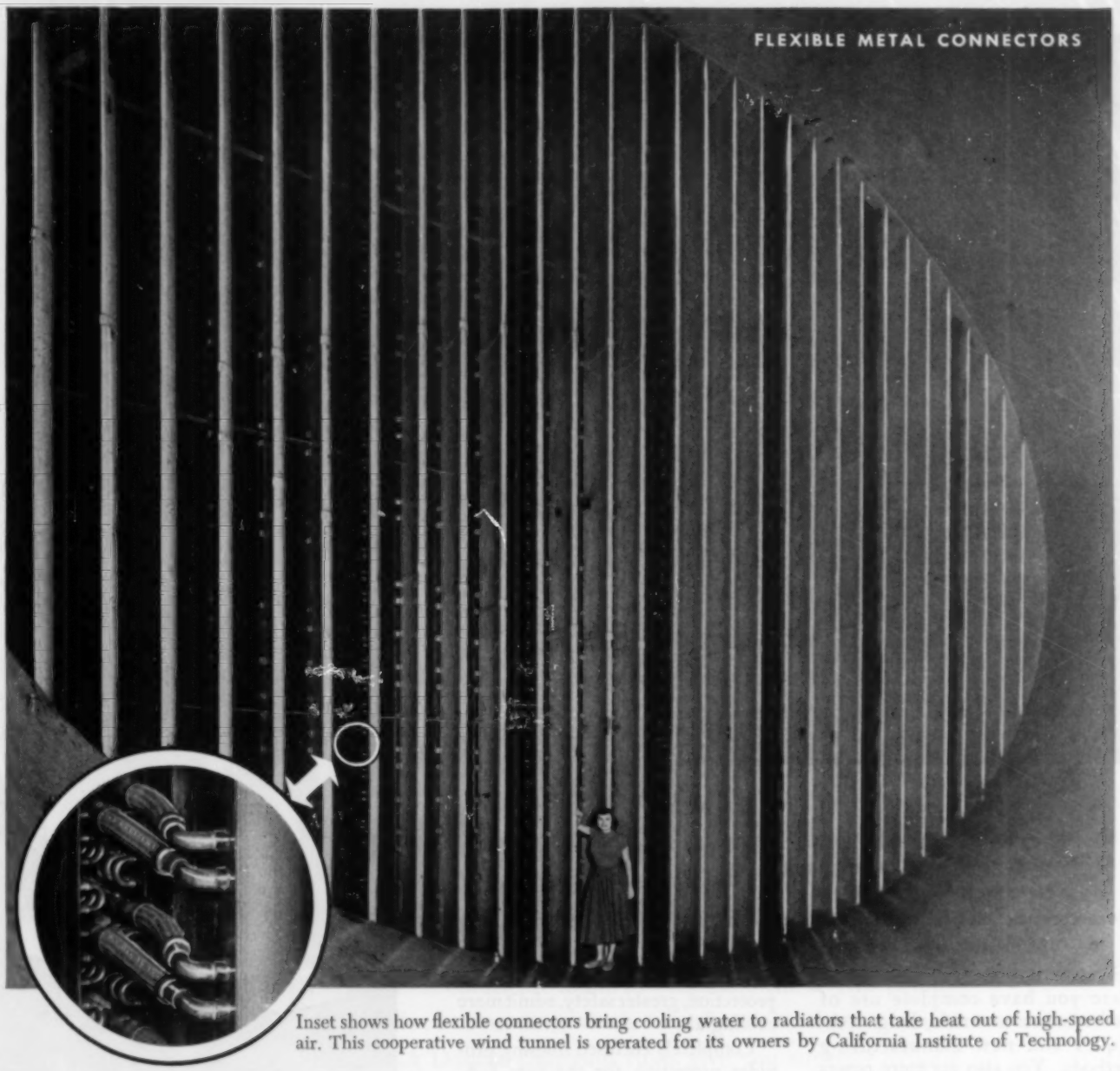
SOUTH MILWAUKEE, WISCONSIN

Upper boom section, bridge-strand connected to the A-frame, is relatively lighter in construction, because it has to carry only the loads resulting from the pull of the hoist ropes and from the acceleration and deceleration of the swing.



Sturdy lower section, securely attached to the A-frame by pin-connected struts to form an integral part of the machine, has ample strength to take the stresses and shock loads of the digging cycle. Widespread boom feet provide a brace effect to take swing loads . . . no cable suspension or sway braces are required.

Circle 7A on reply card



Inset shows how flexible connectors bring cooling water to radiators that take heat out of high-speed air. This cooperative wind tunnel is operated for its owners by California Institute of Technology.

650 Connectors help put the chill on fast-as-sound air

In Pasadena, Calif., five aircraft manufacturers jointly own this giant wind tunnel. There they test designs at air speeds as high as sound itself.

But, when you squeeze air to get such jet-age speeds, you also heat it up. So you look for a way to cool it off. Here they used a solid bank of finned cooling coils; but then they had to get cooling water to them through 650 piping connections. First, they had to consider aligning each opening; then expansion when temperatures rose and fell. And they had to keep the airstream bone dry. No leaks allowed.

They did it the easy way . . . with American Seamless Flexible Metal Connectors known as Vibration Eliminators. They had no trouble installing them. A solder-type connection made them permanently tight.

Maybe there's an idea here for you. American Flexible Metal Hose and Tubing have many uses . . . for connections that must move, bend, vibrate, connect misaligned ports . . . or piping in cramped spaces. They can safely carry almost any liquid, gas, chemical or semisolid. And you can get them in many alloys, sizes and types. Write for Catalog SS-50 to *The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

53242

wherever connectors must move... American flexible metal hose and tubing

Circle 8A on reply card

Here's why

the NEW L.A. *Line*

by the Louis Allis Co.

is your BEST *electric motor* BUY

A smaller, better power package to meet new NEMA standards

with NEW MODERN STYLING

New L.A. open, drip-proof motor

plus

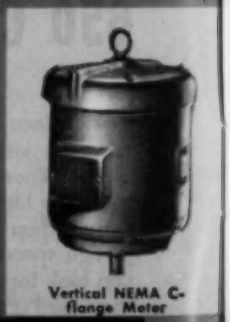
Improved ventilation
New conduit-box arrangement
New bearing construction
More compact design and better protection
More versatile mounting

Here you have complete use of modern motor materials, design techniques and new manufacturing methods. You also get more power in a smaller package — and clean, streamlined motor styling to add modern appearance to the equipment these new motors drive.

This new styling is completely functional. Ventilating grilles, for example, blend into the general motor design — yet they provide better protection, greater safety, admit more cooling air.

Completely enclosed housing provides protection for the new L.A. line in any mounting position — floor, sidewall, or ceiling.

Standardize now on the new L.A. line for both your product and your plant — and get the most modern motor construction available. See your nearby Louis Allis Sales Engineer today for the complete story.



Vertical NEMA C-flange Motor

NEMA D-flange Motor

NEMA C-flange Motor

THE LOUIS ALLIS CO.

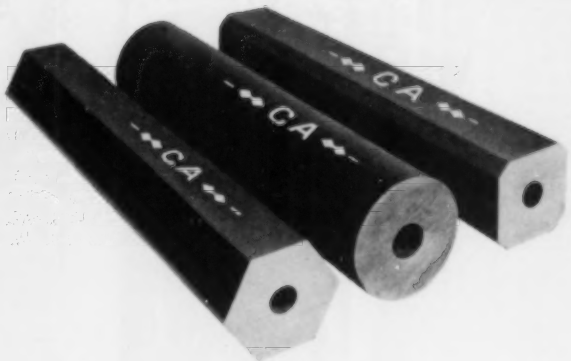
Milwaukee 7, Wisconsin

LA-102

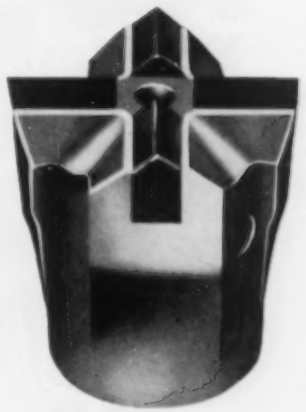
We specialize in SPECIAL MOTORS— *and* PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

TEAMED FOR DRILLING EFFICIENCY....



Crucible CA Double Diamond Alloy Hollow Drill Rods



Crucible HY-Tuf for tungsten carbide bit bodies

Here's a combination you just can't beat . . . detachable bits of Crucible HY-Tuf® alloy steel with tungsten carbide inserts and Crucible CA Double Diamond® Alloy Hollow Drill Rods . . . the toughest, longest-lasting drill steel made.

HY-Tuf detachable bit bodies are made to withstand the terrific pounding of heavy rock drills . . . pounding which no ordinary steel can possibly take. And Crucible CA Double Diamond Rods give you superior drilling performance with minimum rod breakage and bit losses . . . a *team* that provides the *lowest cost per foot of hole drilled.*

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

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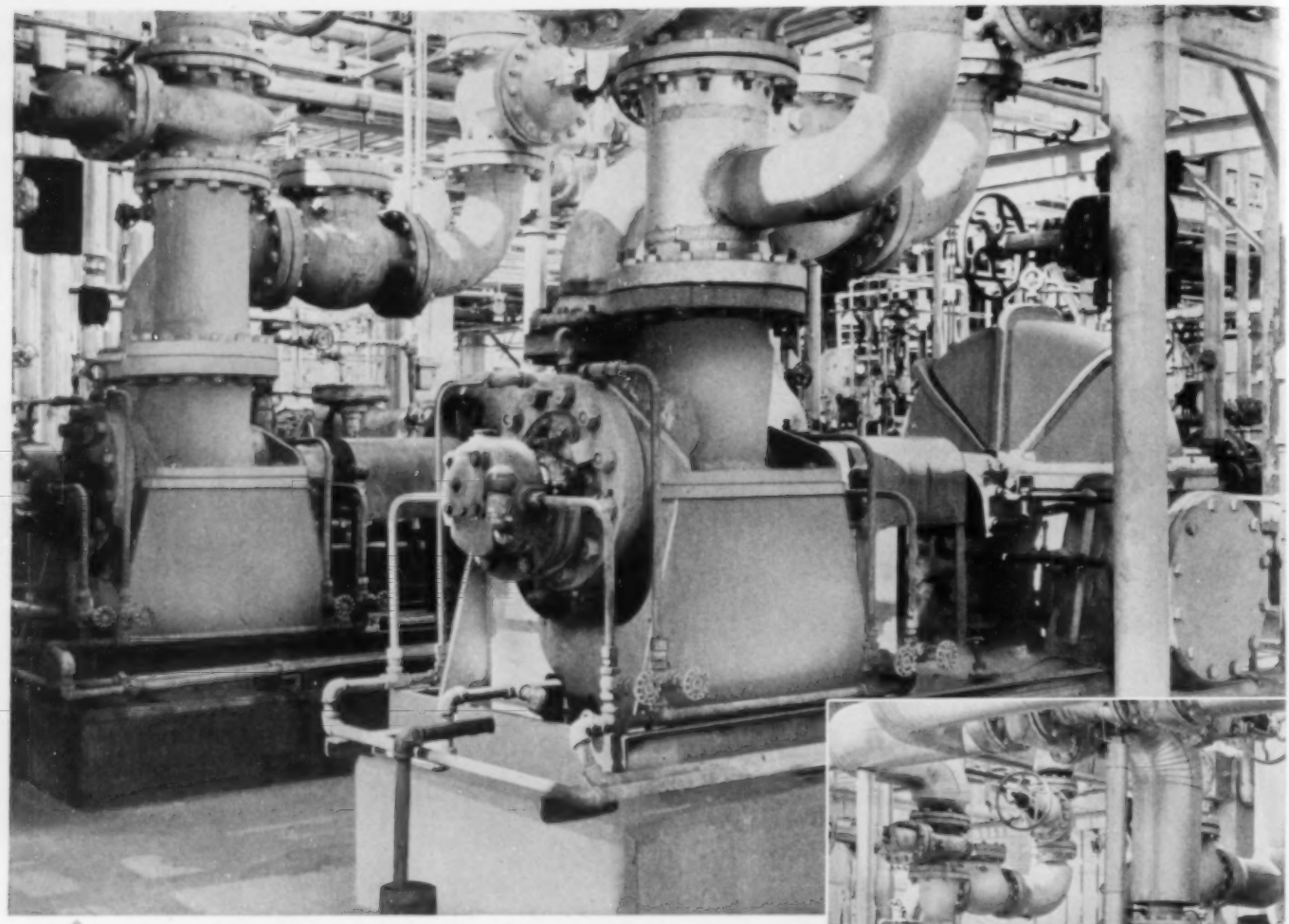
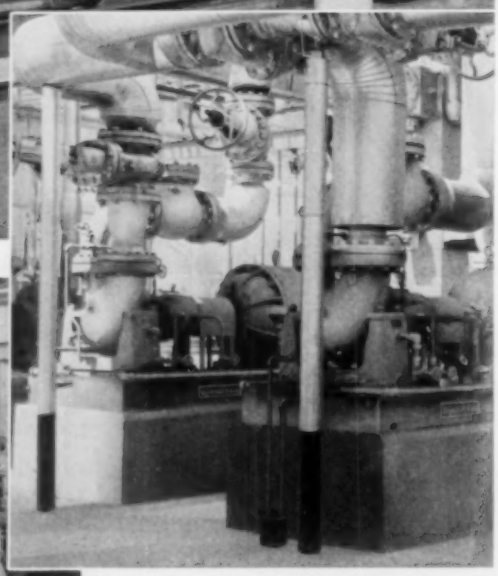
Circle 10A on reply card

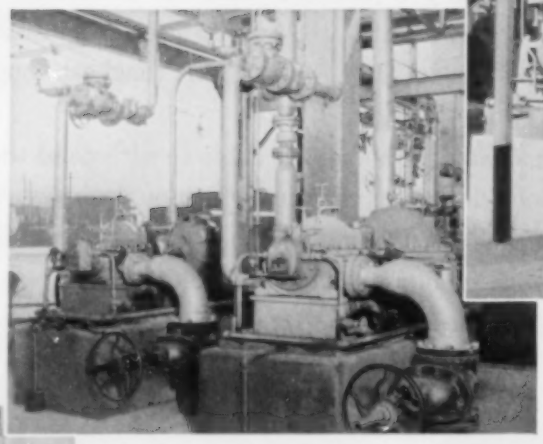


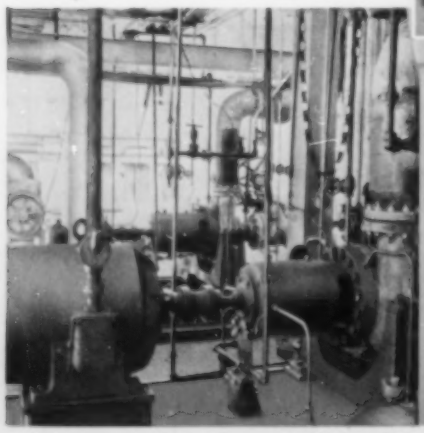
These two I-R single-stage, vertically-split units circulate 950 gpm of solvent through the Aromatics Recovery Plant at 485′ head.



These two-stage pumps charge the Platformer with depentanized gasoline or naptha. Similar units are on boiler feed service at Cosden.

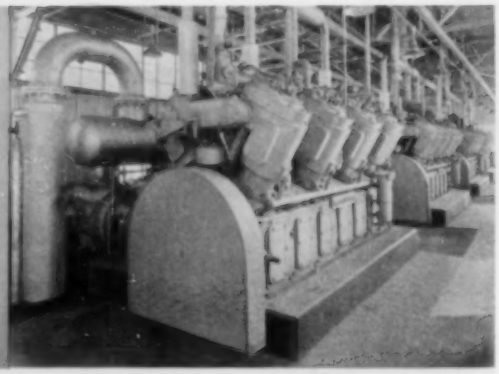
On the toughest of refinery jobs, these I-R slurry pumps have given dependable service. 600° gas oil, containing .8 lb/gal of catalyst is circulated through heat exchangers.





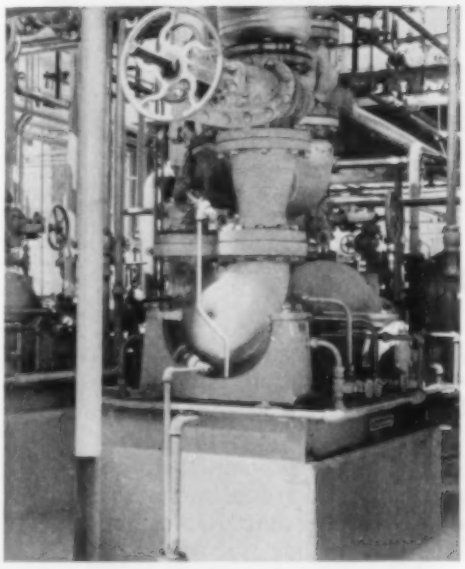
I-R COMPRESSORS SERVE CAT-CRACKER AND PLATFORMER

The four Ingersoll-Rand gas-engine-driven units at the right compress recovery gas from the cat-cracker to 215 psig. Their successful performance record has resulted in the installation of five other gas-engine compressors at Cosden.



Ingersoll-Rand Pumps circulate the "Life Blood" of another great refinery.

...at Cosden Petroleum Corporation, in West-Central Texas.



Three I-R vertically-split, single-stage pumps on feed preparation service for Cosden's Platformer.

The Cosden Refinery in Big Spring, Texas marks the first installation of a combination Platforming and Aromatics Recovery Plant for simultaneous production of nitration-grade benzene, toluene and xylene from petroleum hydrocarbons.

Here, as at all petroleum processing plants, *centrifugal pumps* are the heart of the entire operation—circulating the liquids that constitute its "life blood" through miles of piping, processing units and storage tanks. To stay "on stream," operating engineers can take no chances on performance and dependability when it comes to process pumps.

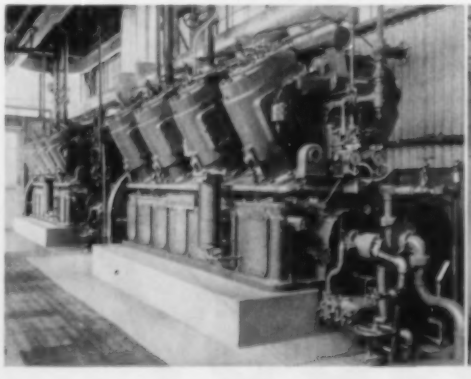
At Cosden, as in refineries the world over, Ingersoll-Rand pumps and compressors are living up to their reputation for continuous, heavy-duty performance year after year, with minimum attention and maintenance.

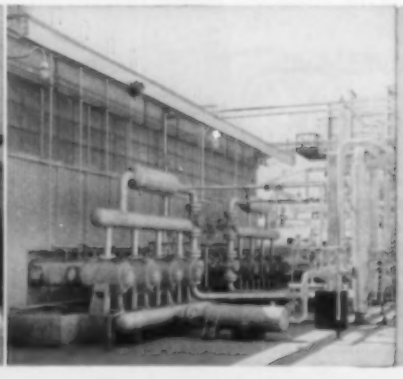
Whatever your processing requirements, Ingersoll-Rand's specialized experience in the petroleum field can save you time, trouble and expense. For information, contact your nearest I-R branch office.

Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York 4, N. Y.

10-68

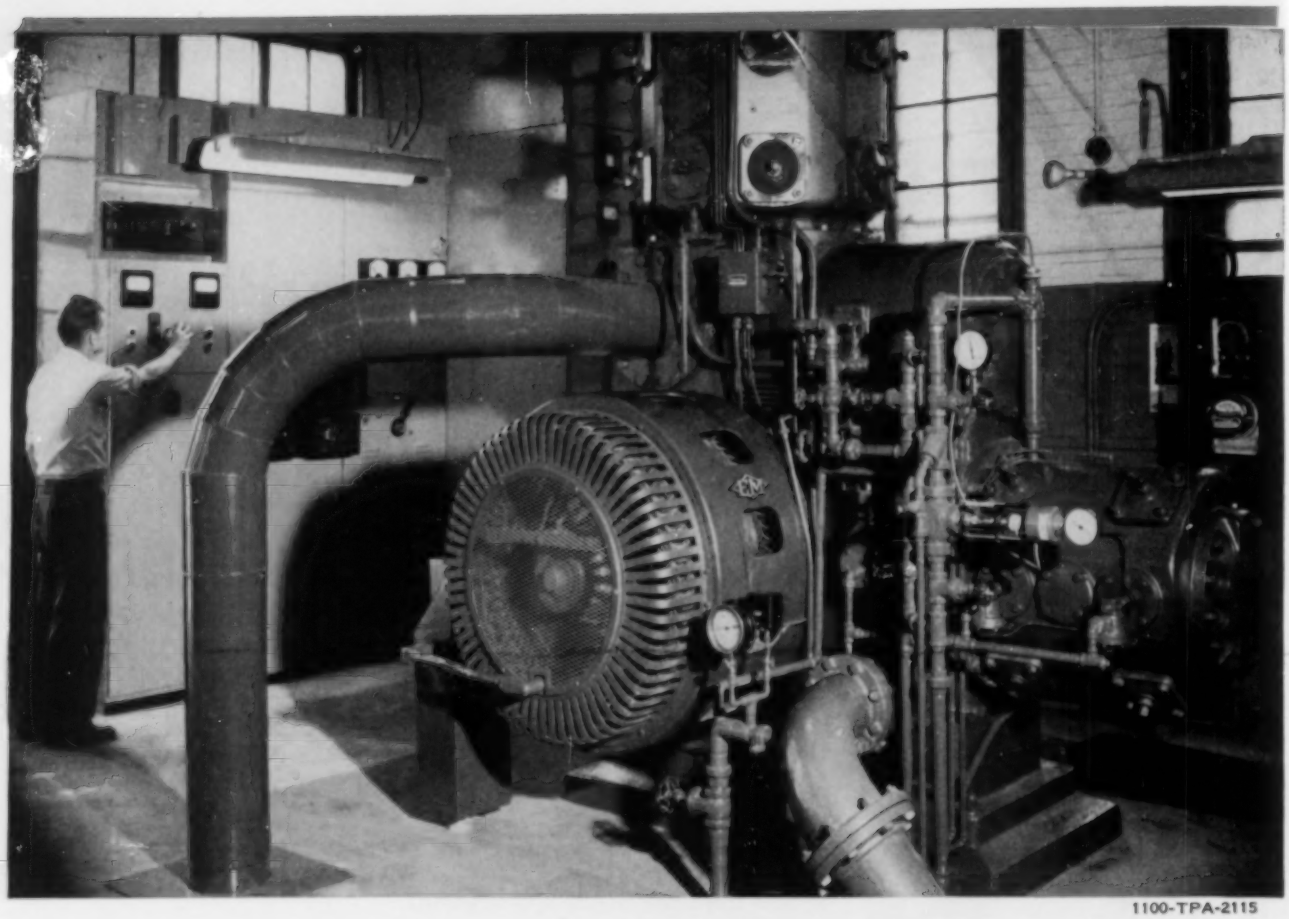




Two Ingersoll-Rand 8 XVG gas-engine-driven compressors, with non-lubricated compressor cylinders, supply clean, oil-free hydrogen to the Platformer at 850 psig. Compressor cylinders are outside the building, separated by fire-wall construction as shown in the first photo at left. A third unit is now being installed to increase capacity.

GAS & DIESEL ENGINES • VACUUM EQUIPMENT • PUMPS • COMPRESSORS

Circle 11A on reply card



1100-TPA-2115

How to Make Compressors Take up Less Space

Want to save some valuable floor space?

Here's how it is done on the air compressor drive installation above:

The compressor is driven by a 200 hp, 514 rpm E-M Synchronous Motor, overhung mounted. Stator and rotor are mounted directly on compressor frame and crankshaft. Motor bearings as well as losses from belt drives and couplings are eliminated. The drive motor thus becomes a compact, integral part of the entire compressor unit.

You'll save space on any compressor with a direct-connected E-M Synchronous Motor. E-M engineers possess a unique background of experience in tailoring Synchronous Motor characteristics to drive requirements of every type of compressor. This skill, plus E-M's knack for condensing drive units into least possible space, should be considered when you plan your next compressor installation.

Also, you'll find that E-M Synchronous Motors can improve plant power factor and reduce power costs. For example, an E-M Motor rated at 0.8 leading power factor will furnish sufficient leading reactive KVA to correct a low power factor condition which may be caused by demands of other plant equipment.

Ask your nearest E-M sales engineer to demonstrate how these E-M benefits can be applied to your specific requirements. And write the factory for E-M Synchronizer No. 32, the air compressor number.

...the man at the controls

starts, stops and protects the motor with E-M special feature Controls ... magnetic, for automatic operation ... full-voltage, for economical starting ... dead-front panels for maximum safety ... overload and undervoltage protection ... and the exclusive E-M Polarized Field Frequency Relay system, simplest and most ingenious method ever developed for perfect synchronizing.

ELECTRIC MACHINERY MFG. COMPANY

MINNEAPOLIS 13, MINNESOTA

E-M

POWER THAT THINKS...E-M SYNCHRONOUS MOTORS AND "CONSCIOUS" CONTROLS

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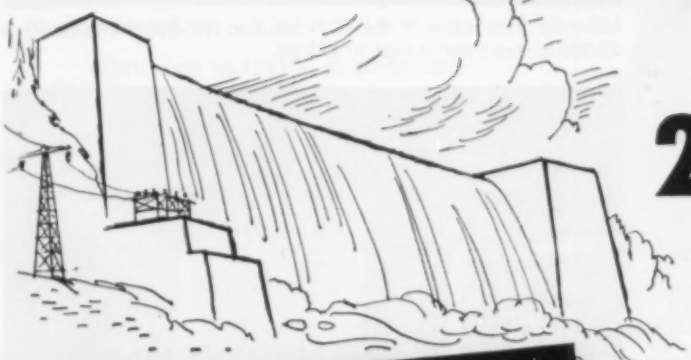
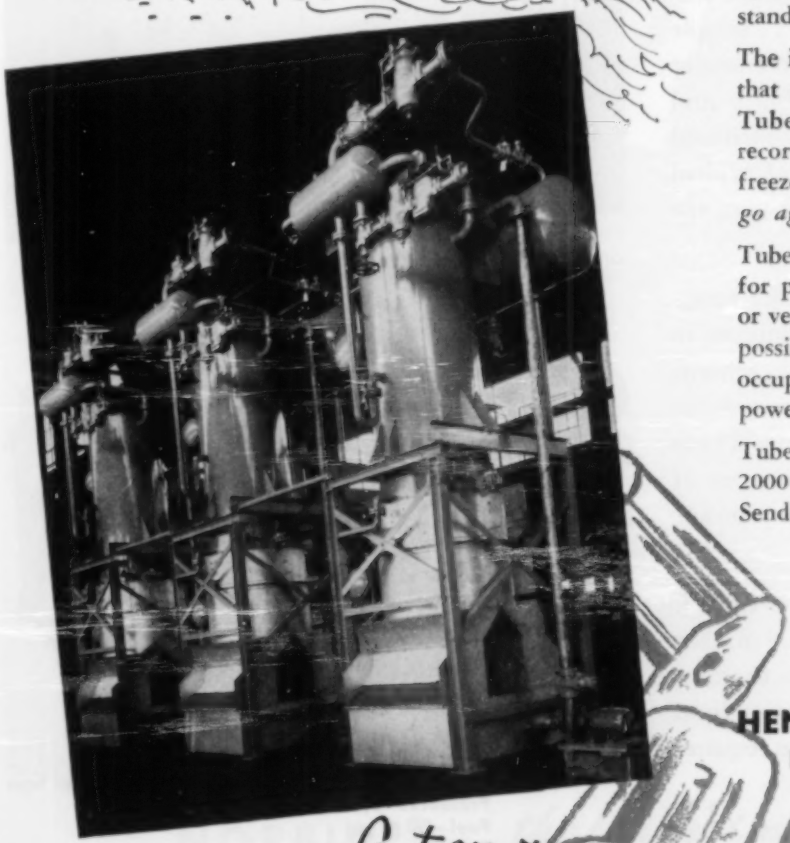
186,072,500 pounds of Tube-Ice used in building 2 WESTERN DAMS*





Yes—that much ice was required to cool the concrete mix in order that it set properly to develop its ultimate strength for two outstanding dam structures.

The important part of this message to you is that the compact and readily portable Vogt Tube-Ice Machines pictured here set this record without even the replacement of a freezer tube. What's more, they are *ready to go again* whenever ice is needed in quantity.

Tube-Ice is widely used in process work and for preserving shipments of meat, fish, milk or vegetables . . . and is produced at the lowest possible cost per ton since a Tube-Ice unit occupies less space, has fewer parts, uses less power than any other method for making ice.

Tube-Ice Machines are available in sizes from 2000 lbs. per day up to any desired capacity. Send for free Bulletin TI-3.

**McNary Dam, Washington, and Pine Flats Dam, California, required a total of 2,730,000 cu. yds. of ice cooled concrete mix.*

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New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

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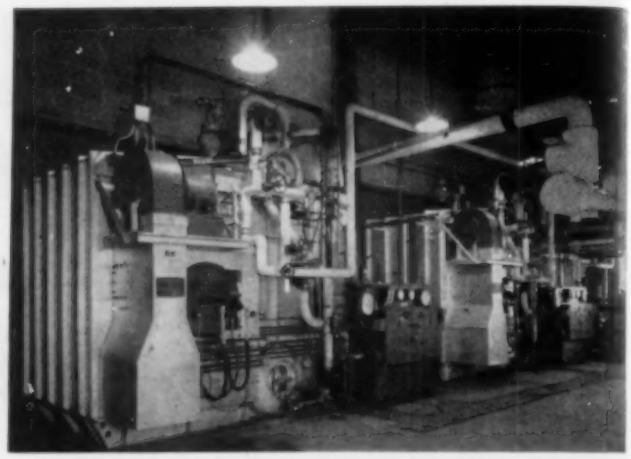
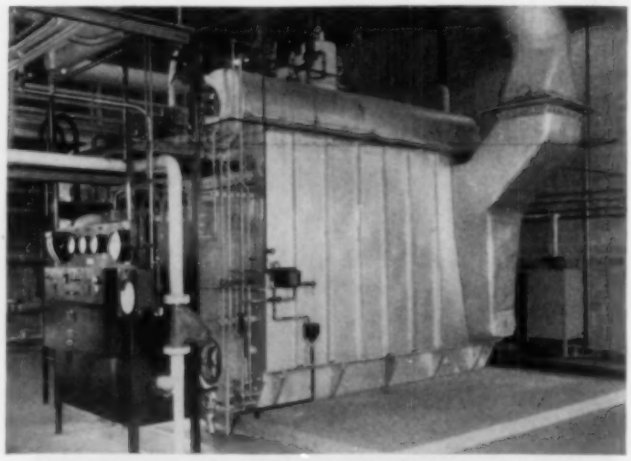
Vogt TUBE-ICE MACHINE

Circle 13A on reply card

Why are they Buying VP Boilers?



Industrial installation in the Midwest. Two VP Boilers. Capacity—28,000 lb steam per hr each at 225 psi.



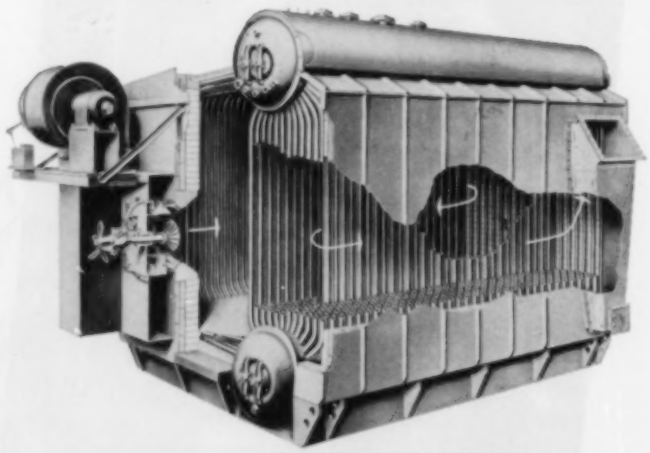
This VP Boiler serves a sewer pipe manufacturer in California. Capacity—20,000 lb steam per hr at 215 psi.

There's good reason for the fact that so many buyers of package boilers are finding that the VP offers them more for their money. For only in the VP will you find such significant *extra* features as —more water-cooling area per unit of furnace volume than any other boiler of its class . . . simple arrangement of baffles for maximum heat transfer . . . large lower drum for good accessibility and easy handling of load swings . . . quiet centrifugal fan, with less than half the noise level of typical high-speed blowers used on most other package boilers.

Little wonder then that VP purchasers range from small companies to some of the largest in the country . . . industrials of all kinds . . . schools and institutions . . . various government agencies . . . even the Atomic Energy Commission. These users are employing VP Boilers for all types of applications—heating, process, and even power generation.

Make sure then that you have details of the VP at your fingertips when next you are in the market for a boiler of moderate capacity. Ask for the new Catalog VP- 204, which contains specifications and general information on dimensions, space requirements, construction details and controls.

B-7488



Specifications—VP Boiler

Capacity—4000 to 30,000 pounds of steam per hour
Pressures—Up to 500 pounds per square inch
Fuel—Oil or gas
Erection—Completely shop-assembled
Foundation—Simple concrete slab

C-E

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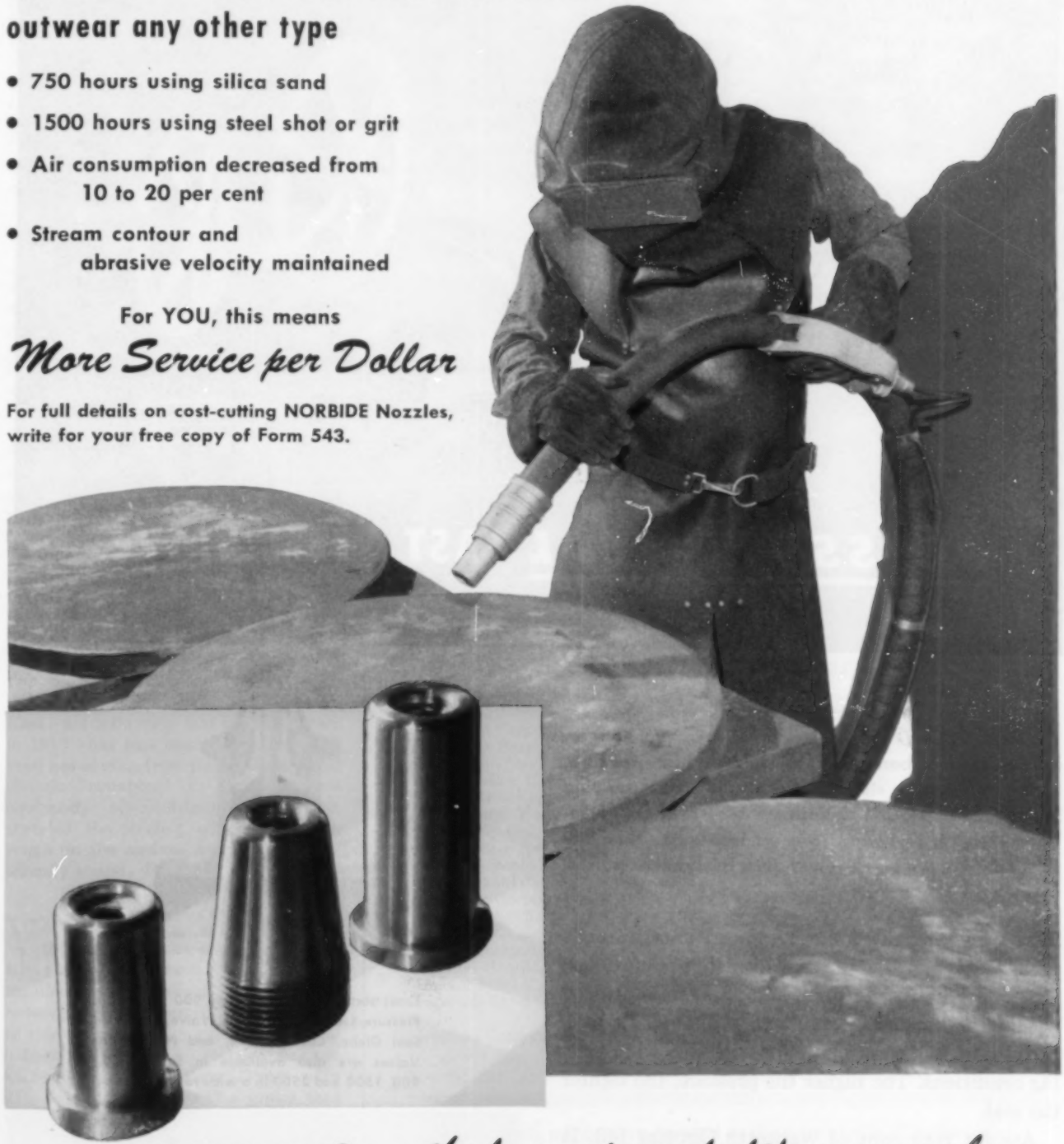

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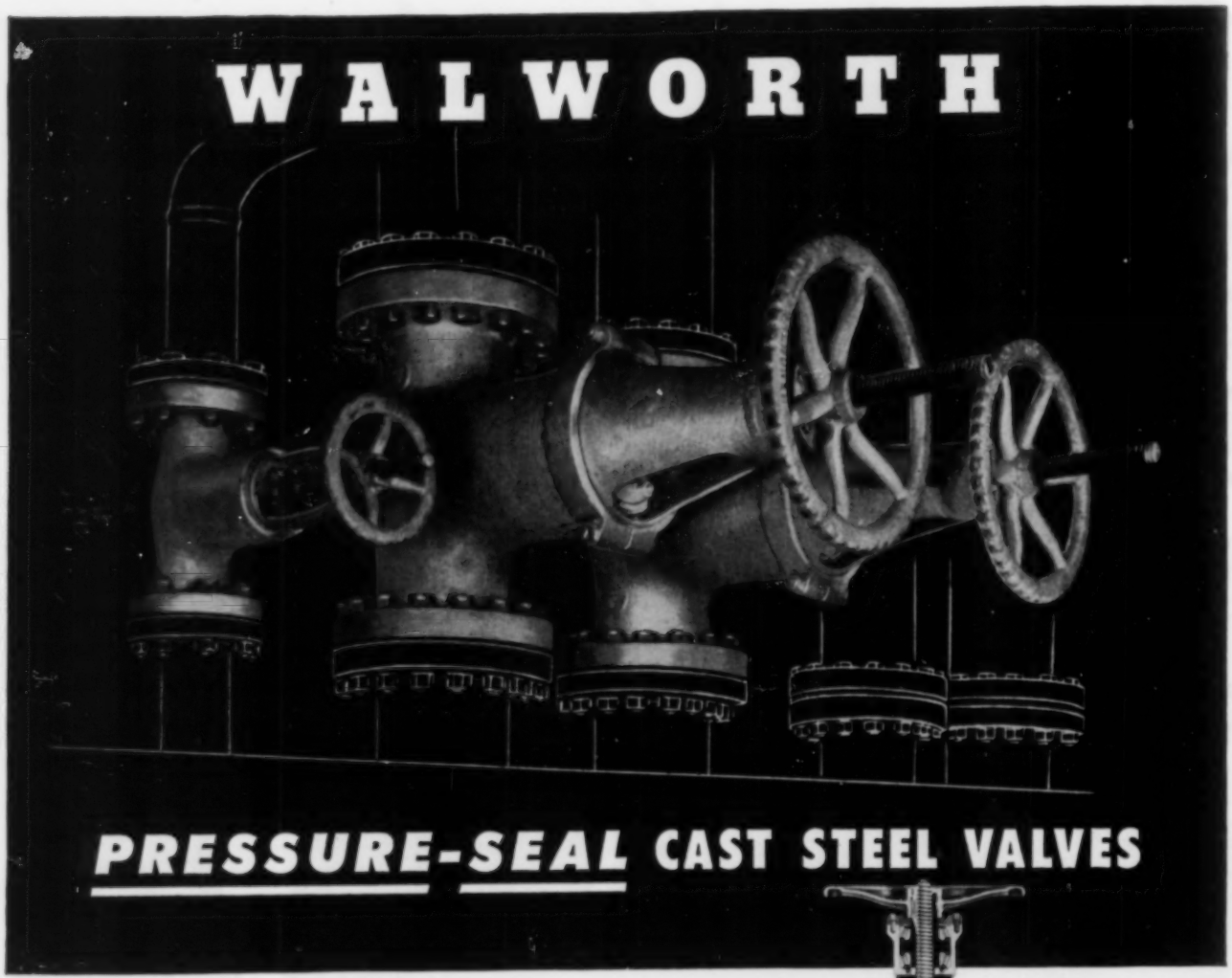

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Ask for your copy of Walworth Circular 143. It gives detailed information, including sizes, dimensions, and specifications for all Walworth Pressure-Seal Cast Steel Valves.

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ON THE COVER

ON WORKING days tens of thousands of New Jersey residents cross the Hudson River into New York City in the morning and go back at night. On Sundays and holidays, on the other hand, New Yorkers flock to the Jersey hinterlands and return in the evening. They don't plod, like the weary plowman of literature, but they do at times creep. Our cover picture shows the toll booths at the New Jersey end of the George Washington Bridge a few minutes after 5 o'clock on a Sunday afternoon. Of the ten lanes of traffic, seven, on the right, are moving towards New York and three are bound from the city.

IN THIS ISSUE

LEADING off is the first of two articles dealing with the problems dust and other atmospheric contaminants create for men and machinery. Clean air is becoming steadily scarcer, especially in urban communities, where smog has, on occasions, reached lethal concentration. Proof of its seriousness in Los Angeles is found in a recent 134-page report which estimates that around 3100 tons of chemical materials are emitted daily to the atmosphere over the city. Included are approximately 1500 tons of hydrocarbons, to which automobile exhausts contribute 1180 tons.

•

NEW Jersey was a pioneer in highway development, being the first state (1891) to give counties financial aid in building roads. By 1913, forty-two states had followed its lead. The granddaddy of concrete roads in the East—a 1-mile strip laid in New Jersey in 1912—has just been resurfaced. All vintages of cars, from the handle-steered electric "runabout" to the telephone-equipped, air-conditioned limousine, traveled the stretch, which had worn rough on the surface but remained internally sound. Page 248.

•

VIRTUALLY all tourists who visit the Royal Gorge of the Arkansas River in Colorado each summer are enthralled just by looking at it. A few, however, seek the super thrill of trying to ride through its 25 miles of rapids in a boat and stay dry. Nobody has yet succeeded. *White Water Derby*, page 252, is a picture story of a group that tried and failed.

•

MOST western power dams, including the mammoth Hoover and Grand Coulee structures, have divided powerhouses. However, at Chief Joseph Dam, on the Columbia, all twenty-seven 100,000-hp generating units will be in a single structure. The 2036-foot-long, 150-foot-high powerhouse will be almost as large as the dam itself. Page 254.

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PROTECTING MEN AND MACHINES FROM DUST

BETTMANN ARCHIVE PRINT

RESPIRATORY FILTERS OF TWO ERAS

Fifty years of progress in personal filters is pictured here. Just above is a lady of 1900 accoutered for an automobile ride. Her veil kept some of the dust off her hair and out of her nostrils. The man is wearing one of the latest devices produced by Willson Products Company to protect individuals from excessive dust concentrations. The specially felted filter disks (one set on each side) are replaced when dust-laden.

The atmosphere in which we live is laden with impurities

R. J. Nemmers

LAWLOR-DEVANEY PHOTO

WHERE ATMOSPHERIC CONTAMINATION STARTS

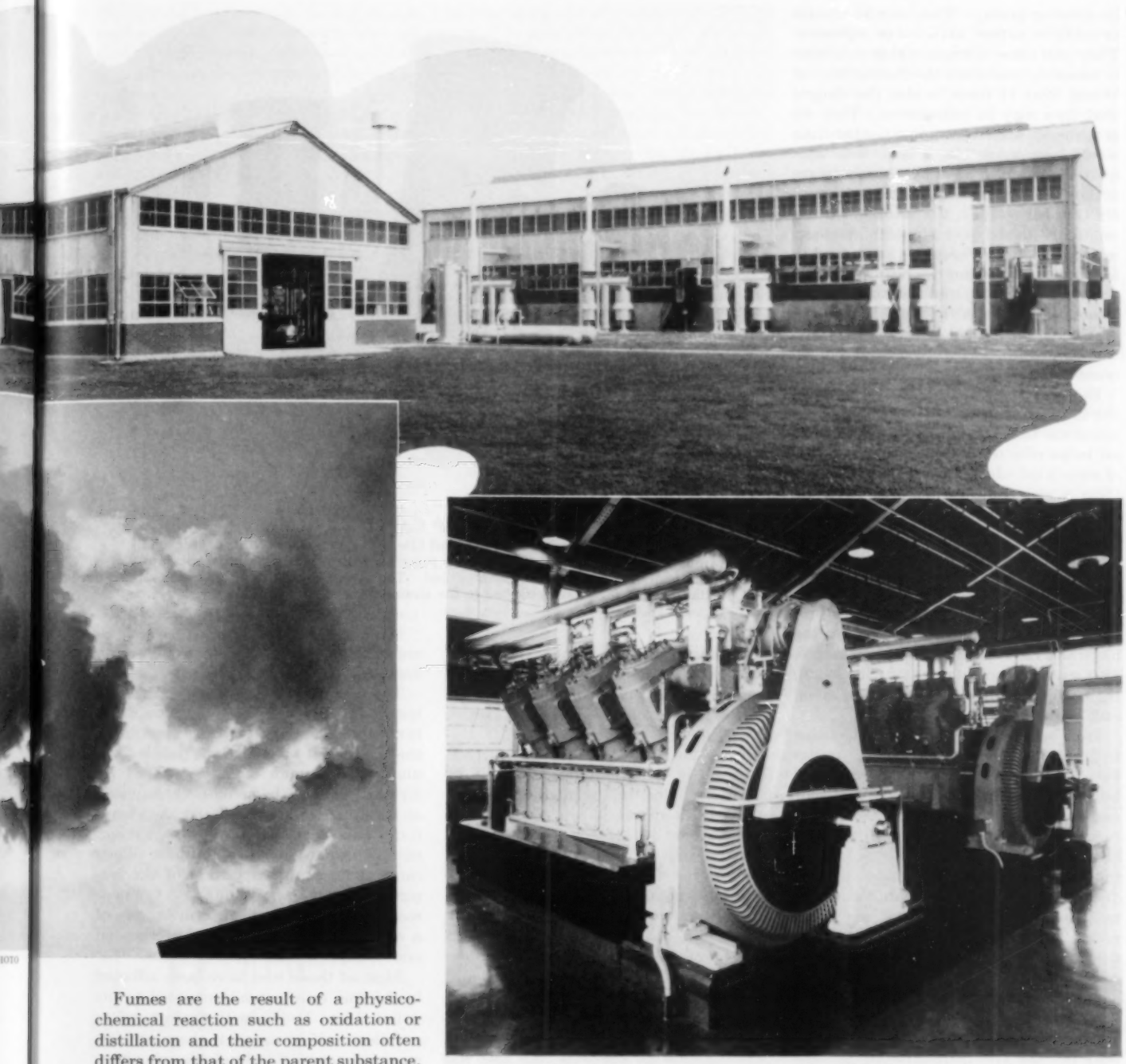
Although industry cannot be blamed for all pollution in the air, it does create a good deal of it. The day is rapidly approaching, however, when stacks like those shown will no longer belch forth such great amounts of dirt. Most industries try to be good neighbors in their communities, and for those who don't, smoke abatement laws are being rigidly enforced. The equipment for reducing industrial contamination of the air is available; all that is needed is to apply it correctly.

"WANTED: Unlimited air supply; it must be clean." That is how a shop might advertise for a supply of air in a newspaper's classified section.

If the atmosphere surrounding the earth were all compressed to a uniform 14.7 psi there would be, roughly, a billion cubic miles of air available. That would leave little chance of our ever running short. Getting clean air, however, is a different story. Ever since man first walked on the earth he has been bothered to some extent by dust and dirt in the air around him. But never has the degree of air-borne trouble approached that of today. Dust and fumes, in combination with certain atmospheric conditions, have led to the modern metropolitan afflictions that have come to be known as smog and smaze. Dust is the villain in many stories about machine and tool depreciation. A nuisance to housekeepers, domestic and industrial alike, it can also inflict torture on thousands of people who suffer from allergies. In short, dust is a menace to man's morale, his physical well-being and his machinery.

But dust isn't the only thing that pollutes the atmosphere these days. The contaminants, although many and varied, can be lumped in two general classes: aerosols—tiny bits of matter floating in a gaseous medium, in this case air—and alien gaseous substances. This article will point out some of the ill effects of the former type and list some of the means by which man may obtain an air supply as clean as he needs for one purpose or another. It is largely the story of filtration, although other methods enter into it.

All aerosol contaminants are commonly called dust by the layman, but those concerned with them classify them as dust, fume, smoke, mist and fog. To effect their removal from the air it is necessary to know the exact composition of each one because different constituents may require a different approach. The first, true dusts, may be termed miniature things—little rocks, tiny pieces of wood, bits of cloth and ashes. In most cases they are the products of disintegration, that is, crushing, grinding, blasting, fraying or any other process that reduces the parent material into powder or fragments. The size of the particles ranges from macroscopic (those the naked eye can see) to submicroscopic (those that cannot be seen even with the aid of a microscope).



CLEAN AIR FOR GAS ENGINES

Two Ingersoll-Rand 8-cylinder gas engines driving electric generators that supply power for the compressor station of a natural-gas pipe line are shown at the bottom. Alongside the building in the upper view are American Air Filter Cycoil oil-bath filters that clean the intake air used by the engines and by similar ones that drive compressors. The expanse of lawn surrounding the station, besides looking nice, serves to keep down dust.

Fumes are the result of a physicochemical reaction such as oxidation or distillation and their composition often differs from that of the parent substance. The most common ones are *condensed* vapors from normally solid materials such as metals. These are called metallurgical fumes and generally occur as oxides. The size of most fume particles is one micron* or less.

Smoke is caused by incomplete combustion of organic matter. There is tobacco smoke, wood smoke, coal smoke, etc. The term is also applied to the mixture of solids, liquids and gases produced by combustion, though technical treatises on the subject distinguish between fume and true smoke.

Mist and fog are liquid air contaminants. Mist is the product of liquid disintegration while fog, according to some classifications, is the product of vapor condensation. In the sense of weather, fog is composed of moisture which has condensed on floating dust. Generally speaking, however, there is no difference between the two except that fog could be looked upon as consisting of finer or smaller droplets than mist. The size of fog and mist particles ranges from less than one micron to about 40 microns. Droplets larger than that are usually so heavy that they precipitate. There are still other pollutants to be taken into account, and these are the living organisms such as pollens, viruses, spores, bacteria and even tiny insects. Pollens range in size from 5 to 150 microns, spores from 1 to 10 microns, bacteria from 0.2 to 5 microns and viruses are submicroscopic.

Aerosols take many forms. They can

*A micron is 1/1000 of a millimeter or 1/25,000 of an inch. The lower limit of visibility with unaided eyes is generally considered to be 10 to 40 microns. Anything smaller is in the microscopic class.

be clean or greasy. They can be caustic or acidic in nature, abrasive or explosive. They can cause allergenic skin reactions or sneezing, and since the closing days of World War II there is also the danger that they may be radioactive. They do get around, sometimes going farther than would seem possible. That was adequately demonstrated by the chain reaction set off by Mrs. O'Leary's cow. On October 8, 1871, that storied bovine reputedly kicked over a lantern in a barn in Chicago, Ill. Forty days later ashes and fine cinders from the resultant great fire were picked up and identified in the Azores. More recently there has been a great deal of publicity about the errant travels of radioactive dust from the H-bomb tests in the South Pacific.

But dust does not ride exclusively on the ill wind that bears no man good, for scientists tell us that some dust in the air helps rain to fall. In fact, a particle of some kind (dust, ice, etc.) is needed to form a rain drop—something solid on which water vapor can condense until it is heavy enough to fall. Nature supplies an abundance of dust for this job through the erosive action of wind on soil and rock. She has also provided for its removal from the air by rain and has protected her creatures against it by placing natural filters in their nasal passages. Just as with most things on this earth, there was a balance until man came along and disturbed it.

It is axiomatic that man's troubles with dust are largely self-made. It has been estimated that for every ton of coal burned some 50 pounds of dust and soot and fumes are spewed from the world's furnaces, to say nothing about the countless other sources of pollution. Indeed, in some centers of population and industry atmospheric contamination is measured in tons of soot fall per cubic mile. The difficulty started even before the so-called industrial revolution. As early as 1273 the British Parliament enacted a law prohibiting the burning of Sea Cole (probably a soft coal so named because it was found in outcroppings near the sea and to distinguish it from charcoal) because of the "smoke and unsavoury vapors therefrom."

Air pollution varies markedly from one location to another and even from one level to another. It also depends on ambient weather conditions. It is said that a large city has many areas, each with its own source of contamination. For example, at street level in the Chicago "loop" pollution may be caused by concrete dust and rubber particles kicked up by and from countless scuffing shoes and tires; by tobacco, gasoline and other smoke; by lint from clothing and even dandruff. Frequently the individual particles contain or are the host of microörganisms of one sort or another. There are also mists and fogs, as well as gaseous contaminants such as carbon monoxide. (In fact, when the writer asked what contaminants are present at ground level in one of our large municipalities he was told, "You name it; we've got it.")

A GOOD CATCH

This illustration shows why strainers and filters are necessary. But for this small strainer an air-operated device that was supplied with air through hose of inferior quality probably would have been ruined. The lining decomposed and this unhealthy rubber diet was being fed to the strainer.

If we take an elevator up, say, 300 feet, we would find different kinds of pollution. This time it might be caused by lesser quantities of smoke and larger amounts of other aerosols from places far away. By driving a few miles and getting into the heart of the industrial district we would come across still other contaminants. There one can identify fumes and smoke; dust from metal, paper and cloth products; oil mists and vapors, plus varying quantities of well-nigh any other pollutant one could name, including, perhaps, some pollen from fields many miles distant. Then if we were to hop the 6:05 to Suburbia and test the atmosphere there we would detect yet other sources of contamination. The same holds true if we were to take a trip to farming areas, to national parks or if we were to travel on an ocean liner.

Likewise, the degree of pollution differs markedly with the location. In rural and clean suburban districts the range is generally between 0.02 and 0.2 grains (weight) per 1000 cubic feet. In a downtown metropolitan section the concentration in the same volume of air is generally between 0.04 and 0.4 grains; in industrial areas it is between 0.1 and 2.0 grains; and in a factory workroom it may be between 0.2 and 4.0 grains. But in excessively dirty places it may amount to as much as 400 grains. The minimum explosive concentration is between 4000 and 200,000 grains per 1000 cubic feet, depending on the type of dust.

The greatest effort towards controlling the ill effects of air-borne contaminants is naturally centered on the protection of the health and welfare of the people. The number of human maladies caused by dirt-laden air can be no more than hinted at here. The list is long, and the symptoms and treatments are the subject matter of many medical volumes. They range from simple irritation of the respiratory tract to poisoning and to pneumoconiosis—the medical term for any of a class of ailments caused by repeated and continued inhalation of dusts.

Most of those who have been afflicted in the past were actually exposed to the polluted air. Today, with modern safety practices and equipment, there are few recorded cases of individuals who have been permanently harmed by dust. Then, too, state, federal and municipal laws have been enacted that adequately protect most workers. It would do little good to attempt to quote them here because there are at least 49 different sets in the United States—one enacted by the federal government and 48 by state legislatures, to say nothing about the hundreds of municipal dust and smoke regulations.

There also have been instances where the populace at large has been affected by air contaminants. In two of a very disastrous nature, weather conditions coupled with air-borne poisons actually inflicted loss of life and severe suffering. One of these occurred in the Meuse Valley of Belgium and the other at Donora,

Pa. In each case about twenty people died and some hundreds were hospitalized. Besides, hundreds of head of cattle in the Meuse Valley perished in consequence.

Smoke-abatement laws aimed at preventing the recurrence of such calamities are now a part of the country's law structure, as already mentioned, and generally regulate the number of minutes out of each hour during which smoke of a specified density can be discharged from a stack. The means by which this factor is measured consists of charts with black lines on white backgrounds. When placed at a distance of 50 feet from the observer, the blacks and whites merge into varying shades of gray, which are then compared with the smoke. They are called Ringelmann charts and density or opacity is expressed in Ringelmann numbers.

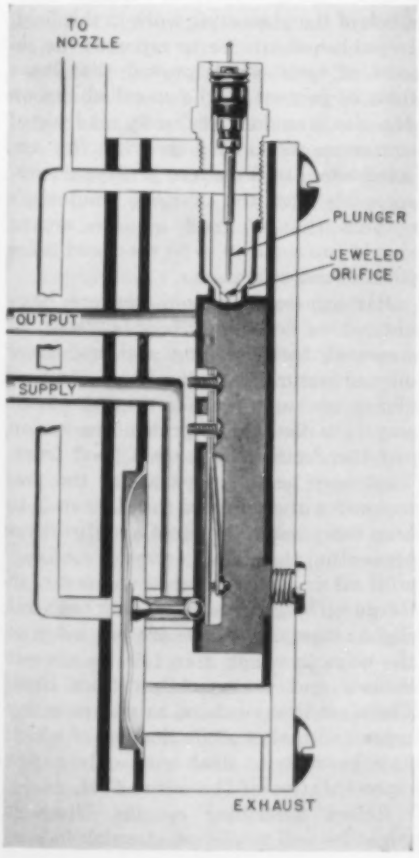
To round out the subject, a brief description of allergens, the agencies causing allergies, should be included. Many are air-borne and, as anyone who has ever experienced the discomfort knows, present a health problem. First it would be well to understand that almost anything can be an allergen, but certain dusts and pollens predominate. Among these are animal danders (dandruff), ragweed pollen, lint from varying fabrics and certain organic dusts. There are instances on record where a man was allergic to his wife or to the ink used by Uncle Sam in printing money. There is no safe, sure way of controlling allergies except to stay away from the allergens, although in some cases repeated medical treatment has built up a sufferer's resistance to a given one. Many allergies are seasonal, which explains the numerous vacation centers that advertise the absence of allergens in the air by publishing pollen counts daily.

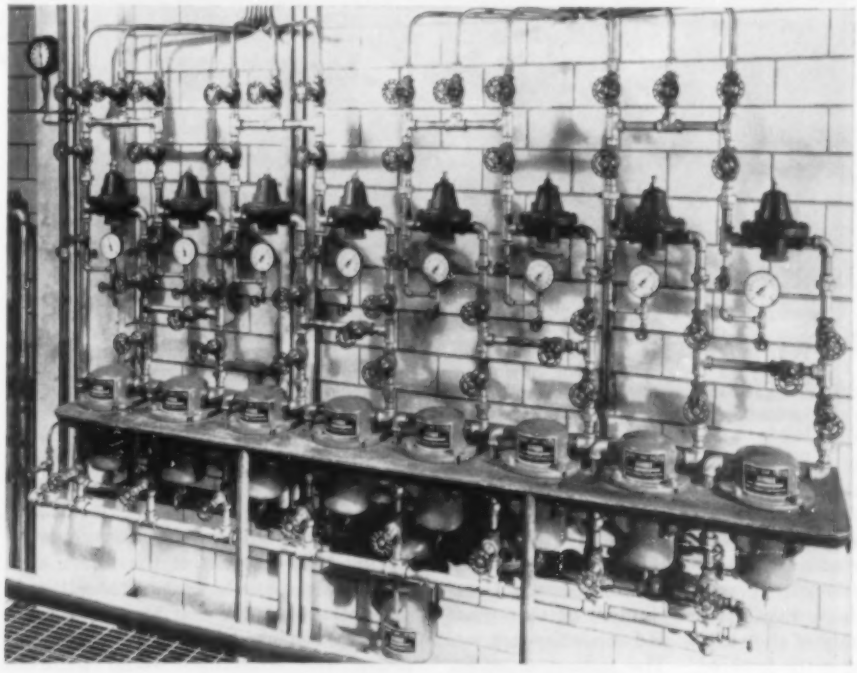
Besides those who actually might be harmed by dust and those afflicted with allergies, there are many others to whom dust is a nuisance. Studies have shown that workers laboring in dusty areas are oftimes less productive than their brothers engaged in similar but cleaner places. It has been proved repeatedly that filtered air, not necessarily cooled or conditioned, has raised worker morale and efficiency to such an extent that the cost of the air-cleaning installation was paid for in a short while.

There are no laws that protect machines from dust save perhaps those dictated by economics. It stands to reason that any means of making them last longer results in lower yearly charges for overhead. With the possible exception of corrosion, dust is their greatest enemy. The continual abrasive action of dust and grit on highly polished surfaces can soon reduce a fine piece of equipment to so much junk. This fact is recognized today, and the question of providing protection for machinery is not so much one of shall or shall not but one of method. It was not always this way, however. As late as 1933 this magazine carried articles dealing with air filtration and expressed concern over the lack of cleaning devices on many compressors of that day. The following quotation from one of them serves to point up the advantages of proper air filtration.

"The compressor plant consisted of eight machines ranging in piston displacement from 2,000 to 4,125 cfm and having a combined piston displacement of 27,180 cfm. Prior to the installation of filters considerable difficulty was experienced in keeping the compressors operating satisfactorily. Over a 3-year period the total repair-and-maintenance cost was $10,005.60. Of this sum $6,645.60 was expended for labor in cleaning and repairing valves and cylinders; $1,560 went for material for valve repairs; $900 was spent in reboring six high-pressure cylinders; and $900 represented the cost of new pistons, rods, and rings.

"During the three years following the





TO PROTECT INSTRUMENTS

Pneumatic controls for delicate and critical operations require far cleaner compressed air than all other devices that use it. The drawing at the left shows a Foxboro controller relay. Air is bled through a jeweled orifice to a controller nozzle and, even though the utmost precautions are taken to insure a supply of clean air, an occasional fleck of dust may be carried into the relay and catch on the critical orifice. The manufacturer has therefore provided a plunger device that is manually operated from time to time to clear the tiny hole. The other illustration shows nine Dollinger Staynew pipe-line filters that protect air-operated combustion-control instruments in the thermal power station of a public utility. Air entering these units is first deflected against a baffle that causes heavier foreign particles and slugs of liquid to drop out and then flows through disks of fine-textured felt, held under compression, which removes the last traces of contamination. This is another instance of two types of cleaners being combined to produce higher efficiencies.

THEY OFTEN WORK IN DUSTY PLACES

Four Ingersoll-Rand Gyro-Flo portable compressors are shown as they were supplying air for drilling rock during the construction of the New York Thruway. Because of the nature of their job, portables must often operate in very dusty locations; hence two air filters (picture at the bottom) protect them. The one on the left is of the oil-bath type made by Air-Maze Corporation and serves the air compressor. A similar unit, manufactured by Donaldson Company, Inc., serves the General Motors diesel engine that furnishes power for the unit.

installation of filters, the total repair-and-maintenance bill dropped to $2,059.20. It was found unnecessary to rebore any of the cylinders or to replace any of the valves, and the labor cost was greatly lowered. The indicated saving attributable to the filters was $7,946.40 for the 3-year period, or $2,648.80 annually. In addition to the reduction in repair-and-maintenance charges, the oil consumption was cut from 65 to 35 gallons a month. At 60 cents a gallon, this amounted to a further saving of $216 a year, making the total annual reduction in costs $2,864.80. After the subtraction of fixed and operating charges on the filters the annual net saving was $2,228.11.

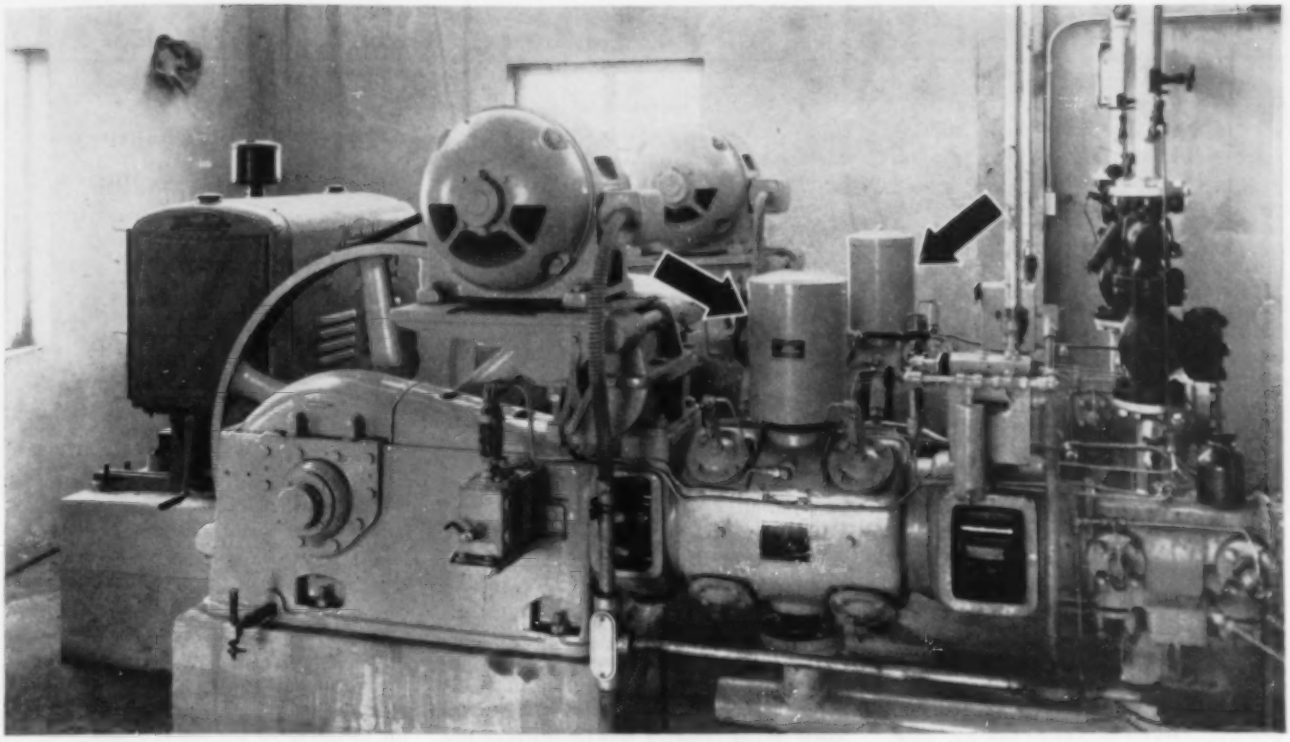
"The annual return on the initial investment of $2,750 amounted to 69.9 percent. On this basis, the savings resulting from the use of the filters were sufficient to pay the cost of the filters in seventeen months." If those machines were to be subjected to the same test today, the economies would be even greater because the cost of labor has risen some 200 percent and that of most other things to a greater or lesser extent. Too, the writer of that example failed to take into account the money lost when the compressors were out of service.

If an employee in a plant owned or supervised by one of our readers were to dump even 1 pound of abrasive dust into an air compressor the man would be arrested for sabotage. Yet, not so long ago, failure to use an air filter allowed many times that amount to enter a compressor. Supposing that the air in an industrial plant carries an average of but 1 grain (weight) of dust per 1000 cubic feet and that an unprotected machine with a capacity of 1000 cfm ran twelve hours a day 300 days a year. Under those conditions it would take in 31 pounds of dust, of which some would be carried over into air lines and into tools or delicate pneumatic controls, instruments, etc. There it would exact its toll in scored cylinders, plugged orifices and ruined apparatus. A percentage of the dust would be deposited in the compressor cylinder and would mix with the lubricating oil, thus forming a harmful cutting compound. After a few months of service, piston rings would be so worn that oil consumption would go up and compressor efficiency and output would go down. The remainder of the dust would form a gummy deposit on valves causing them to leak and necessitating far earlier replacement than if filters had been used.

Air compressors are more affected by dirty air than other machines because of their very nature—they breathe huge quantities of it in doing their daily tasks. Running a close second are internal-combustion engines. And we need look no farther than our own automobiles to discover the importance of proper air cleaning. Although the automotive vehicle has been around for more than 50 years, manufacturers have equipped cars with air filters only during the last half of that period. Barney Oldfield, famed racing driver, is credited with much of the pioneering work in this field. In published articles he reported the results of tests which proved that more than 90 percent of the so-called carbon deposits in engines was really made up of contaminants carried in with the air. Adequate air filtration is in part responsible for the average motorist's opinion that a good modern engine should run some 40 to 60 thousand miles without major repairs.

Perhaps some of our readers have noticed the beautifully kept lawns which surround the pumping stations along oil and natural-gas pipe lines. At first glance one might think that the landscaping is dictated by pride of possession and the desire to put up a good front. That may be so, in part, but the real reason for grass around the stations is to keep away and to lay dust and dirt, thus preventing them from entering the powerful oil and gas engines that operate in the pump houses year after year with but slight attention. These are but a few of the ways in which man tries to protect himself and his machines from dust. There are many others, as well as many types and makes of air cleaners of which it is possible to deal with only a few representative of the entire field.

Before describing specific filters it might be well to discuss cleaning in gen-



STATIONARY COMPRESSORS

Two Dollinger Staynew filters (indicated by arrows) protect these Ingersoll-Rand air compressors from dust and dirt. They are of the dry type in which the filter medium is composed of a special felted material that is pleated into radial fins to provide increased surface area. In the type shown, there is an active filtering area of 24 square feet in a cylinder only 12½ inches in diameter and 21 inches high. The compressors supply air for starting larger gas engine-driven compressors in a natural-gas transmission station.

eral and thereby save making explanations later. Removal of air contaminants, as ordinarily conceived, involves separation by two distinct processes—conditioning the particles and their subsequent removal. Sometimes conditioning is eliminated, but when it is needed it calls for several different procedures. The first and perhaps the most important is wetting; that is, giving the particles a liquid film to make extraction easier.

Impaction is commonly resorted to for the removal of particles larger than 1 micron and is accomplished by directing the air to be cleaned through a spray or a wet screen. The agent used may be water or any of a group of special oils developed for the purpose. The wettability of the particles determines the success of the operation, hygroscopic substances such as salt fumes and certain acid mists lending themselves more readily to wetting than hydrophobic substances such as certain kinds of smoke. Condensation simply means letting vapor, usually live steam, condense on the particles. Electromagnetic deposition of fluids takes advantage of the attractive force between particles of matter with varying electrostatic charges. The latter is not to be confused with the electrostatic process mentioned in the next paragraph.

Another method of conditioning is flocculation. In this case, small particles in Brownian motion (a rapid to-and-fro movement characteristic of certain particles of near molecular weight) frequently collide, the collisions being inelastic; that is, there is no rebound. If the particles are solid, then chainlike aggregates of the substance are formed. Zinc, magnesium and ferric oxides and lead often reveal this tendency, as do some liquid particles. But the latter both collide and coalesce, forming a single droplet rather than "floc" chains. The third method of conditioning consists in electrostatically charging the particles and in collecting them on a plate carrying an opposite charge.

Air filters and cleaners are generally rated as to efficiency (percent of particles removed), which is related to the pressure drop or resistance usually expressed in inches of water gauge. Other considerations are velocity of air flow and volume of air flow expressed in feet per minute and in cubic feet per minute, respectively.

There are several methods of determining the efficiency of an air filter each of which gives a different reading. One is based on weight and is particularly useful where large, heavy dry contaminants are involved. A second entails staining filter paper with an aerosol and comparing the resultant discoloration with a set of known standards either by the naked eye or a densitometer. Ratings established in this manner are slightly lower than those obtained by weight tests. By a third process a microscopic count is made of the number of particles a filter retains. The latter is especially applicable for light loadings. It is the most accurate of the three when done carefully, but it is a tedious and time-consuming job. The efficiency ratings are generally lower than the others.

Radioactivity is playing an increasing role in determining the efficiency of air-cleaning devices. However, the results are often erroneous because the filter may adsorb or retain on the surface certain gaseous radioactive substances the emissions from which should not be counted in studying the removal of particulate matter by filtration. Further, some of the radioactive emissions may be blocked or may be absorbed by the filtering medium.

All research work is done with the aid of test aerosols many of which have been recommended or approved by the various bureaus and societies concerned with air cleaning. It is of no interest here to discuss their content; suffice it to say that the extent of the contamination is known to a close degree and that the results of the experiments and tests predicated on those aerosols can be depended upon.

The concluding installment of this article will appear in the October issue.

NEW JERSEY REBUILDS ITS FIRST CONCRETE HIGHWAY

'Seedling mile,' laid for test purposes in 1912, buried under new pavement

C. H. Vivian

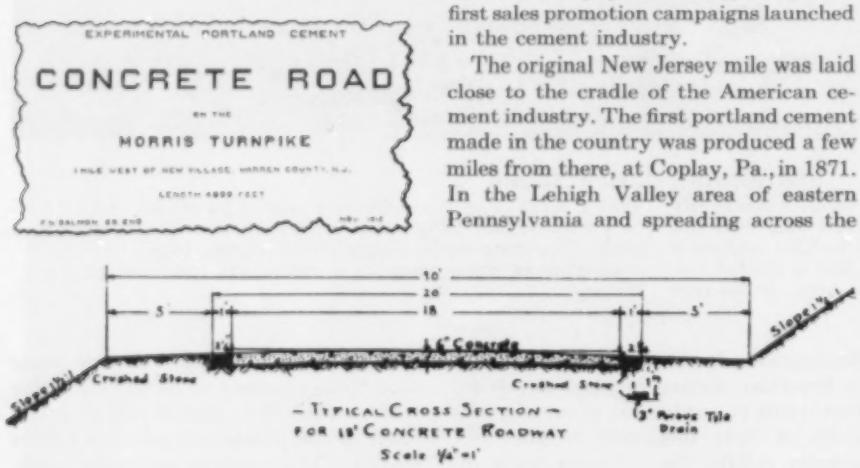
THE State Highway Department of New Jersey recently finished rebuilding the first piece of concrete highway laid in the state. It is a 4800-foot stretch of Route 24, located in Warren County, between Stewartsville and New Village and about five miles east of Phillipsburg, where this magazine is published. It was put down in 1912. There were then 43,000 motor vehicles registered in New Jersey, as compared with more than 1,500,000 now, and there were only 944,000 in the entire United States.

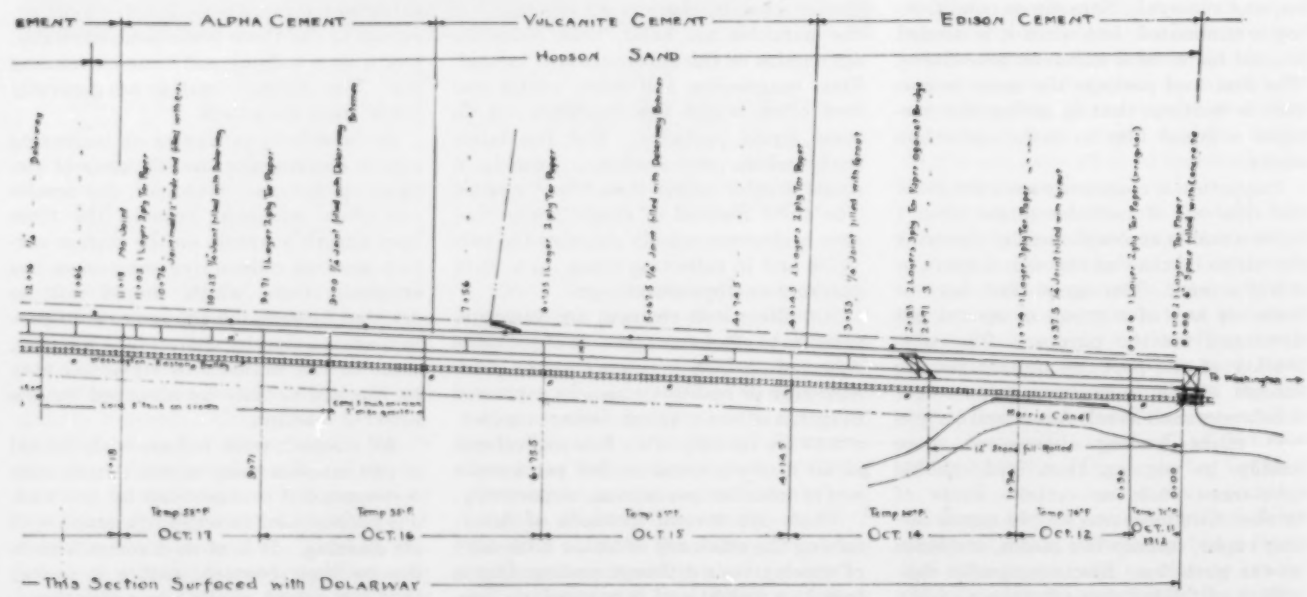
This "seedling mile," as it has been called, was one of the earliest strips of concrete highway constructed in the East. The nation then had only 48 miles of such roadway and most of it was in the Middle West. Concrete was used as early as 1891, in Bellefontaine, Ohio, for paving streets, but until 1907, when the Canadian city of Windsor laid 32,000 square yards of it, few cities had more than a block or two. The first mile of concrete-surfaced rural road was built in Wayne County, Mich., on the outskirts of Detroit, about 1909. It created somewhat of a sensation and attracted the interest of county officials and road-builders in all parts of the country.

Among those who went there to see it and learn what the public thought of it was Joseph R. Thatcher, president of the Warren County Board of Freeholders and one of the state's pioneer exponents of concrete roads. He was partly responsible for the first New Jersey strip, but it was largely the result of one of the first sales promotion campaigns launched in the cement industry.

The original New Jersey mile was laid close to the cradle of the American cement industry. The first portland cement made in the country was produced a few miles from there, at Coplay, Pa., in 1871. In the Lehigh Valley area of eastern Pennsylvania and spreading across the Delaware River into western New Jersey, there were deposits of limestone containing just enough silica to meet the rather loose specifications for cement that then prevailed. For a long time, all the nation's cement came from this section and it was not considered practical to attempt to make it elsewhere. As more knowledge was acquired of the chemistry involved and better grinding machinery was developed, it became possible to locate the mills almost anywhere that a source of calcium carbonate was available and bring in the silica rock required for blending to the desired mix.

Figures from the Portland Cement Association show that in 1891 the Lehigh Valley was responsible for 54 percent of the 454,813 barrels of cement produced in the nation. The impetus the section gained is still carrying it along and there are fifteen cement mills located within a 15-mile radius of Easton, Pa. Many of the larger companies started there and even today retain their principal offices in the section.





PLANS OF 1912 MILE

Title-sheet lettering (top), cross-section of 18-foot-wide stretch (center) and part of the plan layout for approximately 1100 feet of the eastern end of the concrete strip. Trolley tracks extending from Easton, Pa., to Washington, N.J., ran alongside the road, and at the right end the old Morris Canal, which connected the Delaware River with New York Harbor, came close to it. The plan shows the daily progress (the concrete was laid in one month), indicates the origin of the cement and sand used in various stretches, gives the minimum temperature each day and shows the locations of all transverse joints and notes the different ways in which they were formed.

PRIOR TO REBUILDING

The view at the left shows the western end of the road before the recent work started. The 5-percent grade in the foreground has now been cut down slightly. The other picture shows where the old stretch of concrete merged with newer construction (about opposite the rear end of the automobile) at the eastern end. The dark strip at the right was added to increase the original 14-foot width at this location. A trolley car line ran at the right when the concrete was laid.

The principal actor in the sales promotion drama behind the project was Arnold F. Gerstell, then president of the Alpha Portland Cement Company. Alpha was one of three cement manufacturers with mills located close to Phillipsburg. Of these, the Alpha and Vulcanite properties were near the town of Alpha and the Edison Cement Company, headed by Thomas Alva Edison, was at New Village, a few miles away. None of these plants is there today and Alpha is the only company of the three that remains in the cement business.

Mr. Gerstell was familiar with what had been done in Michigan and knew that engineers and highway officials all over the country were talking about the revolutionary new type of roadway that seemed to withstand hard service and could be traveled in any kind of weather. He was naturally interested in furthering the use of cement for this new purpose in his territory, but felt certain that the taxpayers of Warren County would not favor the use of their funds for this new-fangled idea. Consequently, he proposed that the three New Jersey cement companies offer to donate the cement required for a test mile if the county would foot the rest of the bill.

He seems to have had no difficulty in getting the cooperation of the Vulcanite Company, but Mr. Edison, who is reported to have been a little deafer than usual when money matters were mentioned, was apparently somewhat balky. As part of his strategy for winning the inventor over, Mr. Gerstell suggested that the test mile be laid "within the shadow of the smoke from the Edison plant." He invited Mr. Edison to his home one day and they talked on the Gerstell front porch. Mr. Gerstell's small son, who is now an Alpha vice president, reported recently what went on there in an article in the company publication.

"Father told him (Mr. Edison) he thought each of the companies should give one-third of the cement, size not considered," Mr. Gerstell recalled. "We were the largest. Father finally said: 'Tom, let's drive over the proposed site of the road so I can show you exactly where it will be and what I think it will do for our industry.' I remember getting in our old Franklin automobile (air-cooled). The three of us walked along the proposed right-of-way. The selling job that afternoon was a masterpiece of kindly persuasion. Finally Mr. Edison succumbed."

The purpose of the "seedling mile" was to demonstrate in the East what had been previously learned in the Midwest. Variations in physical dimensions and in details of construction were introduced so that comparisons might determine which were the most suitable. For example, the width was 14,16 and 18 feet in different places and the thickness ranged from 6 to 9 inches. Transverse joints were included at various intervals, but there was no longitudinal joint. Over a stretch of 1900 feet a bituminous preparation called Dollarway was spread on the top of the concrete and lightly sifted with sand. From all accounts, it wore away quickly.

For some reason that is now obscured, the so-called mile was only 4800 feet—480 feet short. The route of which it was a part was originally built in 1801 with a 66-foot right-of-way. It was first known as the Washington Turnpike and then as the Morris Turnpike and was once a toll road. The site happened to be as good a stretch as could have been chosen for test purposes. Some of it was on high ground, but portions were inclined to be boggy and hard to maintain. Immediately prior to the laying of the concrete, it had been surfaced with macadam.

The old concrete was laid by Salmon Brothers, a contracting firm in Netcong, N.J., that built many miles of Warren County roads both before and after 1912. The chief engineer for the firm was Edward W. Kilpatrick, who is now and has been for many years chief engineer of the New Jersey State Highway Department. Prior to the construction he accompanied Mr. Thatcher and others to inspect the Michigan highways. He was intrigued there by a concrete mixer that proportioned the quantities of the ingredients of the mix and also delivered the batch of concrete to the pouring location in a bucket that traveled a horizontal boom. The machine embodied the key features of present-day mixers, and such a unit had never been seen or used in the East. Mr. Kilpatrick enthused over it so much that Salmon Brothers bought one and it served effectively in laying the New Jersey mile.

Another phase of the work that meets modern conceptions was the inclusion of a longitudinal drain on the uphill side of the concrete to keep runoff water from getting under the pavement. It was not a fancy tile drain, but rather a trench filled with stones and covered with clay.

The procedure that was followed in laying the road is outlined in a pamphlet, "*A Concrete Country Road Built by the State Department of Public Roads of New Jersey*" that was issued at the time by the Association of American Portland Cement Manufacturers, predecessor of the Portland Cement Association. One of the organization's engineers, W.A. McIntire, was sent to New Jersey to serve in an advisory capacity during the construction. The booklet has been reproduced in photostat form

PRESERVED FOR POSTERITY

Two 2½x5-foot slabs of the old road were set in the new pavement, although speeding motorists will likely be unaware of their presence. The view at the left shows one of the slabs, set to grade, being embedded in the new concrete. Resurfacing of the left-hand lane had been completed. The right-hand picture shows workmen starting to remove one of the slabs of the old road with a PB-8 paving breaker and a carborundum saw.

by the Thomas Alva Edison Foundation, of East Orange, N.J., and several of our illustrations are taken from it.

The concrete was mixed in proportions varying from 1 part cement, 1½ of sand and 3 of stone to 1 part cement, 3 of sand and 5 of stone. The aggregate was crushed local limestone, although its exact source has been lost track of, and it was screened to exclude pieces larger than 1½ inches.

After each bucketful was dumped, the concrete was leveled off roughly with shovels, preparatory to smoothing its surface with a templet that was moved along while supported at either end by wooden forms for retaining the concrete. The templet was a 2x8-inch plank. The edge that came in contact with the concrete was curved to give the finished road a crown or camber of one-half inch, and this curved edge was faced with steel. "In addition to shaping the road," the pamphlet stated, "the templet sufficiently tamps the wet concrete."

Use of the templet left small transverse ridges on the surface and these were removed, after the concrete had become firm enough, by troweling it with light wooden floats. Then came brooming, with a stiff stable broom, to roughen the surface to give horses firmer footing. Despite this brooming, it is recorded that horses slipped on the pavement under some weather conditions and the new highway was, consequently, not very popular among farmers until trucks had become common. After the concrete would stand by itself, the side forms were removed, and the edges were beveled at a 45-degree angle by cutting off about three inches with a shovel edge or beating the concrete down with the back of a shovel. The purpose of beveling was to provide a good joint between the concrete and the shoulder "which will permit the wheels to return easily from the shoulder to the road." Shoulders were built of stone and dirt, wide enough to bring the total width of concrete and shoulders to 30 feet.

Some of the ideas on the working of concrete that were expressed in the pamphlet do not prevail today. It was set forth, for example, that "a sloppy wet mix is best for road construction," although the warning note was added that "too much water causes excess flushing of mortar (cement) to the surface. The water either flows off the sides of the road, carrying with it cement and fine sand, thus weakening the mixture, or forms in a pool on the road, and drying out, it causes a depression in the surface. A lack of water prevents the mortar from properly flushing to the top, or necessitates overtroweling to bring it there. If the concrete is too dry, it is difficult to roughen the surface, which is done by brooming." Workers were cautioned about not troweling, brooming or removing the forms at quitting time from concrete laid during the last hours of the day and it was added that "this can be done by the night watchman as soon as the concrete is firm enough."

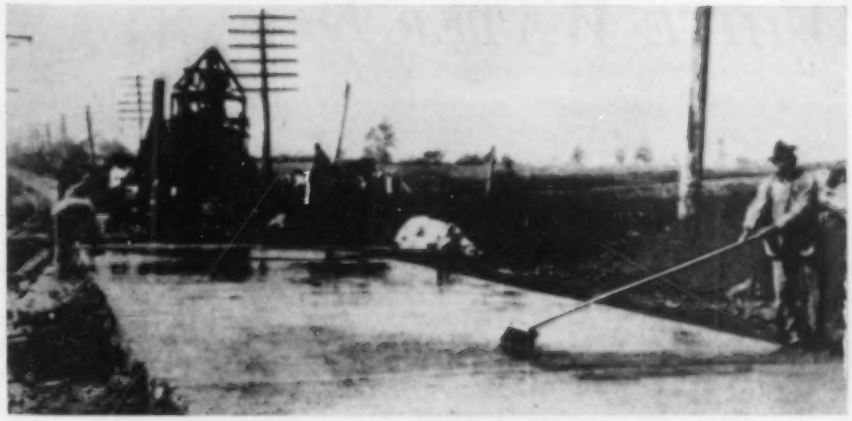
Although it was not built in accordance with current engineering specifications, the road has stood the test of time well, judged by any standards. It is reported, but not confirmed, that the concrete showed a compressive strength of 4500 psi a few weeks after it was laid. State Highway Department engineers who took cores from it in 1950 were surprised to find that years of aging had increased this to around 10,000 psi. This is far above the minimum figure specified for the concrete in modern roads after 28 days in place.

The road was naturally not subjected to heavy traffic in the early years, but successfully withstood quite a pounding from heavy trucks during World War I and this convinced the taxpayers of Warren County that concrete highways were here to stay. Through the years, the old road has undergone repeated patchings and a strip of blacktop pavement was added to one side in the narrower places to bring it to a uniform width of 18 feet. Even so, it was for many years narrower than the newer sections of highway subsequently added at either end. Cracks that inevitably traced irregular courses in the surface were filled and refilled with asphalt until the surface presented a crazy-lined pattern. At no time, however, was any considerable portion of the old concrete removed.

Local pride in having such an early example of concrete highway in their midst, plus the fact that the route has not, for many years, been one of the main through state arteries, kept local residents from complaining about the rough stretch. Modern cars traveled it in a couple of minutes and no one minded a few jolts. The State Highway Department was also loath to modernize the venerable stretch until this became really necessary. Mr. Kilpatrick, in particular, always had a sentimental reason for not changing it because of the part he played in its construction. In 1951 he declared "The Highway Department feels that this road should be kept in service as long as possible and the few cracks in the pavement can be easily repaired."

Out of sentiment, also, and because of the historic significance they carry, two

slabs of the old concrete, each measuring about 2½x5 feet, have been incorporated in the new construction. One was cut from a portion where Alpha cement was used and the other where Edison cement was employed and they have been identified respectively with an A and an E. They have been set flush with the new surface and are both in the eastbound lane, about midway of the 4800-foot stretch. No slab was cut from concrete laid with Vulcanite cement because the company long since went out of business. Although there is no longer an Edison cement plant, the name Edison still means a lot in New Jersey, where the great inventor's son, a former governor of the state, still lives and heads various Edison enterprises. As for the Alpha company, it is still a leading factor in the nation's cement industry and furnished all the cement for this reconstruction project.



BROOMING

The instruction book issued at the time of the original construction explained that "brooming prevents horses and motor-driven vehicles from slipping." An ordinary stable broom was recommended for use and it was observed that "it should have a handle of sufficient length to reach half way across the road." The workmen broomed from both sides and made light ridges running across the road.

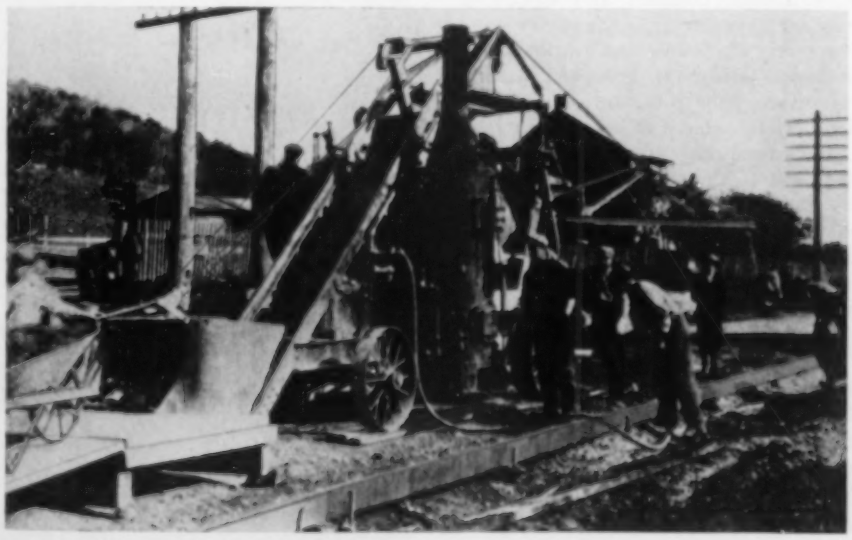
The rebuilding of the historic stretch was done by The Franklin Contracting Company, of Newark, N.J., which entered the low bid of $261,631. The procedure, in general, has been to widen the pavement to 24 feet. The new reinforced, 9-inch thick concrete has been laid on the old surface, for the most part, with an intermediate cushion of crushed rock. In a few places, however, notably at the western end, it was desirable to reduce the grade and this necessitated tearing out the old slabs.

Despite the availability of modern machinery and the familiarity of construction crews with the work they do, it took longer to rebuild the old road than it did to put it down originally. The complications of our highly organized civilization were partly responsible, and, in addition, the contractor was not given a time limit and could work as he pleased. Actually the job was so small, as measured by modern standards, that it didn't warrant bringing in extensive equipment, and this wasn't done. Instead of mixing concrete on the job, the transit-mixed type was purchased from a plant some miles away.

Preliminary work on culverts, etc., was started last fall, but before the contractor could tackle the job of actual paving, it was necessary for the Bell Telephone system to relocate transcontinental trunk lines in conduits buried alongside the roadway. By the time this was completed, the season was too far advanced to begin concreting, so operations were suspended until spring. In order to keep the highway open during the construction, the new concrete was laid in one 12-foot lane at a time and this slowed the progress. The completed pavement was opened to traffic the latter part of July. Motorists traveling it immediately sensed the difference in easier driving and riding qualities because the surface of the old road had, to say the least, grown a bit bumpy.

The construction of concrete highways has become something of an exact science since the 1912 "seedling mile" was planted and the new pavement was put in place under strict controls. One big difference between the new and old techniques was in the consistency of the concretes. To prevent water from carrying the fine cement to the top and weakening the surface, as happened in the original project, highway engineers now use a stiff mix that has scarcely any "slump" when it is piled in a test mound. To make it spread easily despite this stiffness, they add an "air-entrainment" chemical reagent. This is a resinous material that induces the formation of myriads of air bubbles of microscopic size, so small and so distinct from one another that the concrete is not porous enough to admit its cold-weather enemy, water. The bubbles serve as a lubricant and the concrete slides around readily when worked into place in the forms.

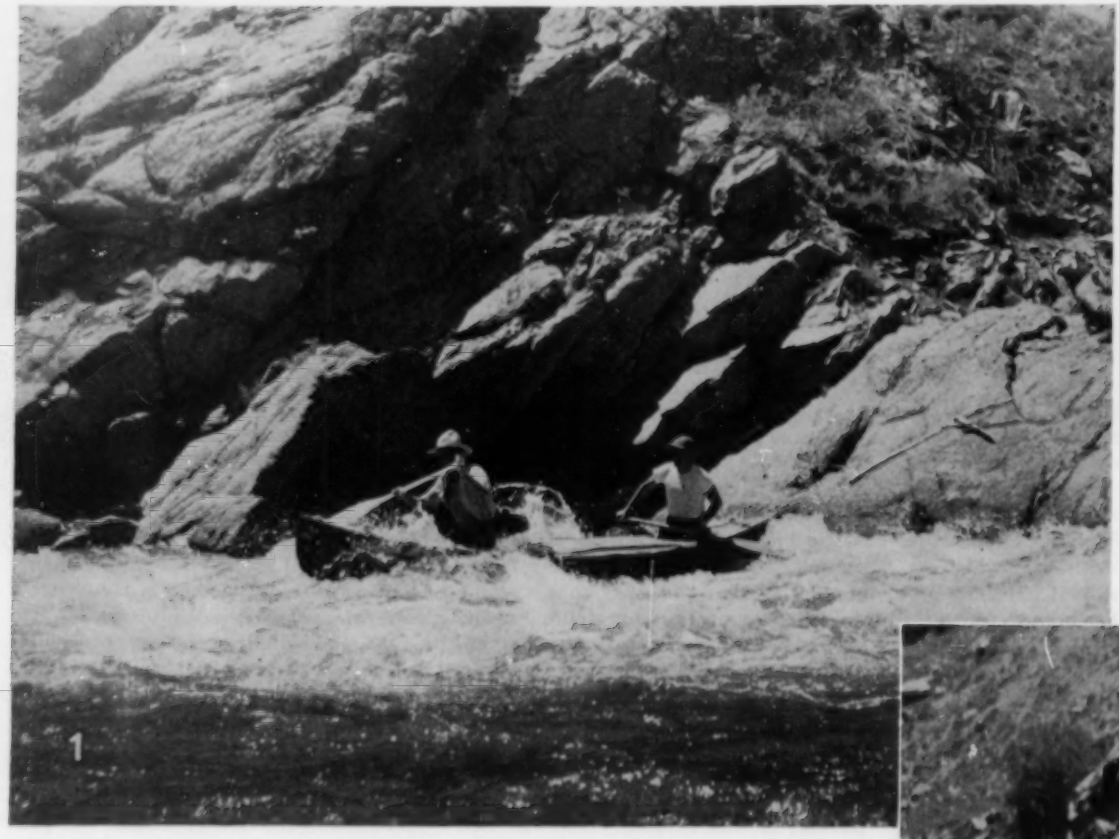
Another difference in the 1954 practice was the inclusion of a longitudinal construction joint. When the first concrete roads were laid engineers observed that they soon developed zigzagging cracks running along the middle. Investigation determined that they resulted from the repetition of tiny flexing movements—the invisible rising and falling of the edges arising from changing day and night temperatures. The same thing happens, on a different scale, if you bend a strip of metal until it breaks. It was about 1923 or 24 that engineers began putting in a straight central longitudinal joint.



1912 CONCRETE MIXER

First of its kind in the East, the self-propelled steam-operated mixer ran on planks, which provided an even surface and prevented the wheels from rutting the compacted subbase. Measured amounts of cement, sand and stone were elevated by bucket and dumped into the mixing compartment. Water was added from a tank bearing a gauge.

White Water Derby . . . CAREY HOLBROOK



THE snarling rapids of the Royal Gorge of the Arkansas River, near Canon City, Colo., have won again. Five expert boatmen and two women came clear from France to find out that the eleven-mile course defies all efforts to navigate it in an open canoe or kayak without taking the craft from the water. A couple of ordinary Colorado men, who should have known better, also tried it.

The French party was composed of Roger Paris and his sister, Raymone; Andre Pean and his wife, Jeanette; Raymond Zubiri, Serge Michel and Pierre d'Alencon. The Coloradoans are Lawrence Compton and Volney Perry, members of the FIB-ARK boating club of Salida. Four of the group got through the gorge in two canoes, but only by carrying their boats around three rough stretches. Two kayaks were lost.

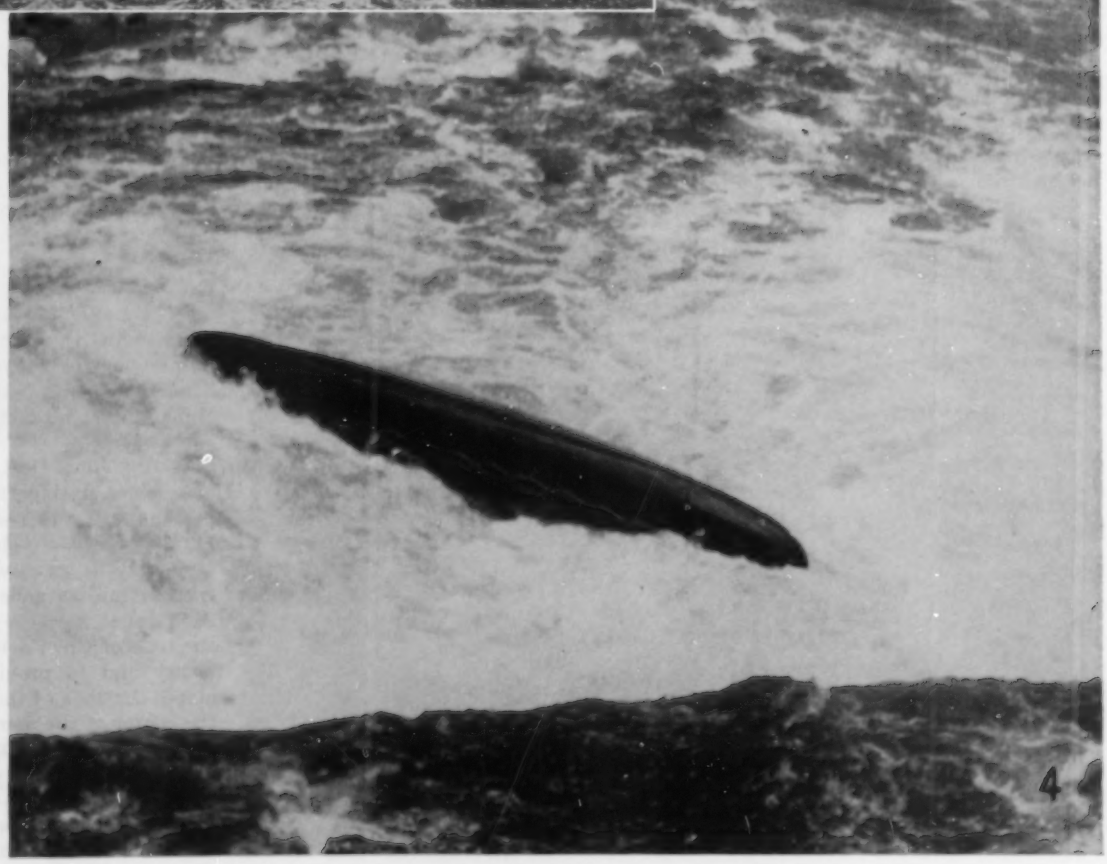
The assault on the rapids was a sort of postman's holiday for the visitors. They came to America to participate in the Salida boat race in the gorge, a yearly event that was held this year on June 20. Zubiri finished second in the professional class and Paris won among the amateurs in the creditable time of 2 hours, 53 minutes, 4.1 seconds for the 25.7-mile run. None of the sixteen contestants was able to ride clear through, so the French group arranged to give it one more try, on June 24, before going home.

After a couple of million years of steady work, the Arkansas has ground out a chasm that is more than 1000 feet from river to rim in numerous places. Down in the bottom the stream roars along trying to dig still deeper. There are white water rapids where the water leaps against boulders and storms at granite ledges jutting out from the sides. There are whirlpools and eddies where driftwood (or a boat) is sucked beneath the surface, only to bob up again farther along. In few places is there quiet water.

In two canoes and two kayaks, the men took to the stream at the head of the gorge. The women loaded their canoe on a motor car and rode down the railroad that borders the stream and didn't go afloat until a stop had been made midway for lunch.

The net results of the day's trials were Compton and Zubiri with wrecked kayaks, the two ladies dumped into the river, and Perry leaving the stream at the half-way mark. Only Paris and Michel in one canoe and d'Alencon and Pean in another made the trip without mishap and they portaged around three stretches.

Although no open boat has ever conquered the rapids in June, Zubiri, John Sibley of Philadelphia, and Tyson Dines of Denver, made it in an unsinkable rubber life raft, but took a severe beating.



1 SEEKING PASSAGEWAY. With spray leaping over their canoe, Pean and d'Alencon head for an open space that will let them through.

2 TROUBLE AHEAD. Paris and Michel approaching a bad piece of water.

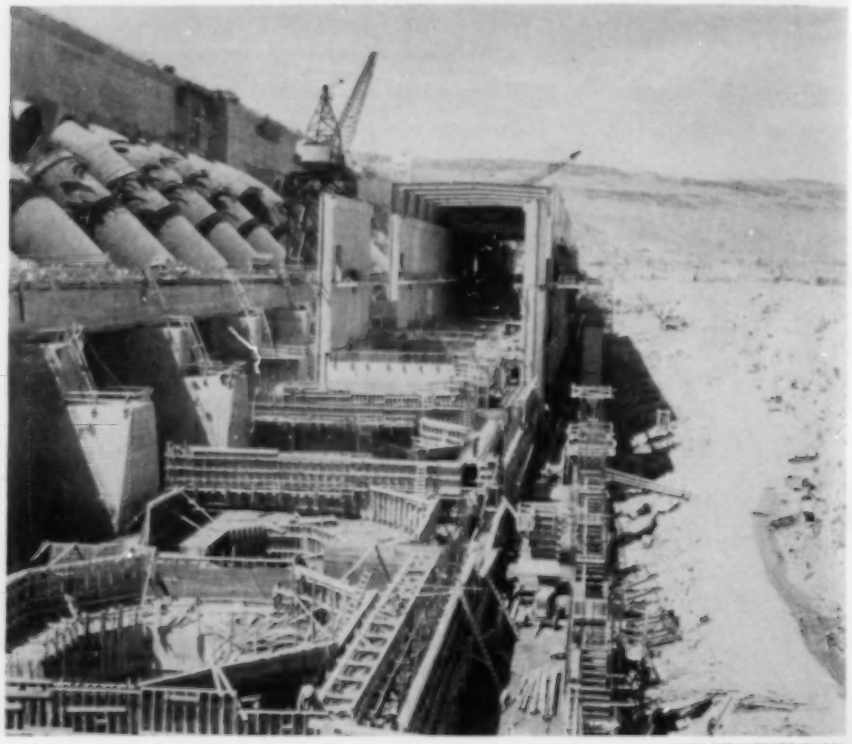
3 BEFORE CRASH. Zubiri, wearing a crash helmet, shoves out into the boiling water. A few seconds later his kayak was ripped to pieces on a jagged rock. He swam out, unhurt.

4 SAD ENDING. Paris and Michel upset their canoe while attempting to launch it after portaging around a rapid. Pean and d'Alencon are in the distance.

Taking form at St. Joseph's Dam in Washington is the nation's

LARGEST POWERHOUSE

L. A. LUTHER



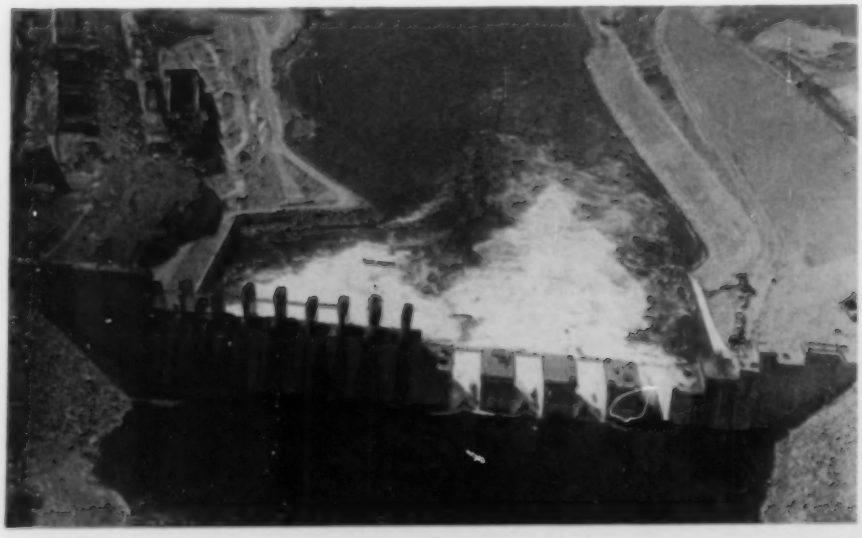
ARMY ENGINEERS PHOTO

POWERHOUSE AREA

Construction scene in early summer. At the left are the upper portions of the partly assembled penstocks coming down from the intake structure. Below them is the basement structure of the powerhouse showing the casements for the turbines being poured. Rising at its far end is the huge enclosure for the generators. Poking above the horizon at the right of the penstocks is the 200-foot boom of the Bucyrus-Erie Monighan crane that helps to deliver the buckets of concrete to pouring locations.

NAMING the dam now under construction at Bridgeport, Wash., Chief Joseph Dam is what might be termed a belated and somewhat rueful tribute to a great native American, a chief of the Nez Perce tribe, who tried pathetically to fill the impossible dual role of Indian patriot and friend and sponsor of the white pioneers. The structure is being built on the edge of the Colville Indian Reservation, about 35 miles from Chief Joseph's grave at Nespelem, Wash.

The barrier will back up the waters of the Columbia River to an average width of half a mile for 51 miles, practically to the tailraces of Grand Coulee Dam. Less spectacular in setting and size than the latter, Chief Joseph will be outranked only a little by its big brother in electrical generating capacity: Grand Coulee has an ultimate capacity of 1,974,000 kw while Chief Joseph will produce 1,728,000 kw. A concrete gravity-type structure, it will rise to a maximum height of 205 feet above the streambed and will have an over-all length of 4300 feet and a gross normal full-pool storage capacity of 480,000 acre-feet. Flow over its 922-foot spillway will be regulated by nineteen tainter-type crest gates measuring 40x49 feet 1 inch (on the arc).



OVER-ALL VIEW

The dam, with the Columbia River pouring through and over the low blocks of concrete that will be built up later. The powerhouse is being constructed along the left bank beyond the dam.

An article in the December, 1951, issue of this magazine dealt with the excavation for the dam and powerhouse, erection of the essential cofferdams and pouring of the concrete in the dam proper. This work was awarded to Chief Joseph Builders, a joint-venture combination of firms, for $25,967,921. The first concrete was placed in the dam footings in September, 1951, and this job is now approximately 95 percent completed. The contractor is currently employing about 250 men on a one-shift operation.

During June, 1954, the Columbia was at a relatively high stage; only about 3 percent of its waters was being held to fill the reservoir behind Grand Coulee Dam and the remainder of approximately 12½ million gallons per second was sufficient to keep the great sluiceways in the base of Chief Joseph running at capacity and to provide an ample flow across the tops of the low blocks left at the center of the dam to serve as a low-level spillway pending completion of the intake structure and powerhouse. It was expected that the sluiceways would handle the entire discharge of a reduced seasonal flow towards the end of the

summer, leaving the tops of the central blocks in the dry and thus making it practicable to step up operations and finish pouring that section of the dam.

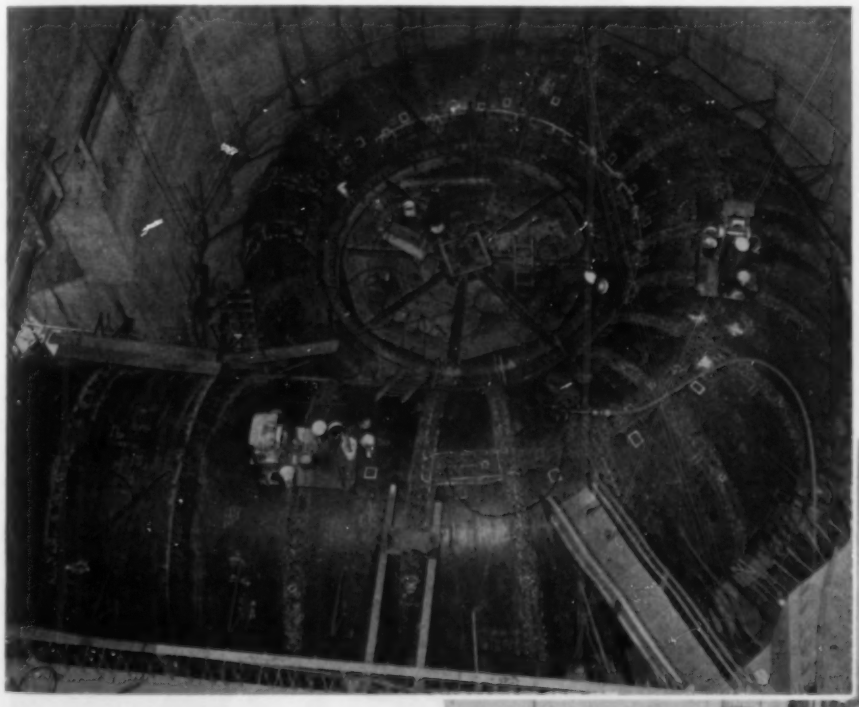
The granitic rock formations encountered at the Chief Joseph site are closely related to those found at Grand Coulee and, similarly, have supplied suitable material for footings. Grouting, which has been completed, was done in three stages, with holes driven to a maximum depth of 75 feet below the footings. Grout input averaged 0.26 sack of cement per foot of hole for the 41,820 lineal feet drilled in rock for the dam and headwall.

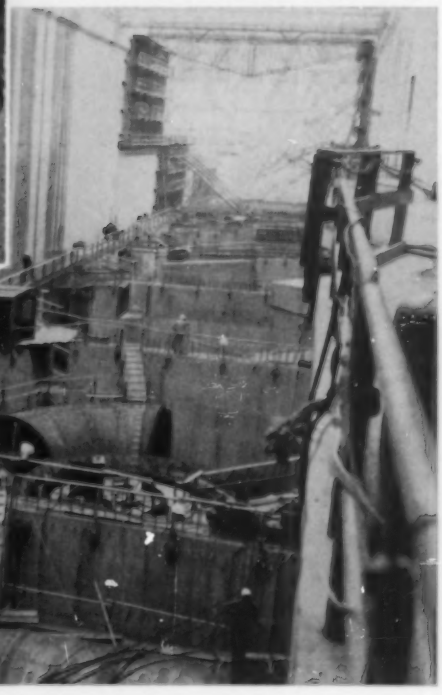
This article deals mainly with the intake structure and powerhouse, a $40,032,408 contract awarded to Columbia River Constructors. The work being done by this group of nine firms is sponsored by Morrison-Knudsen Company, Inc., of Boise, Idaho, and includes, besides, McDonald, Young & Nelson, San Francisco, Calif.; Puget Sound Bridge & Dredging Company, Seattle, Wash.; Macco Corporation, Paramount, Calif.; Walsh Construction Company, San Francisco; B. Perini & Sons, Inc., Framingham, Mass.; The Henry J. Kaiser Company, Oakland, Calif.; General Construction Company, Seattle; and Peter Kiewit Sons Company, Omaha, Neb.

The Corps of Engineers, U. S. Army, builder of the dam, chose to place all 27 of the 100,000-hp turbines and their 64,000-kw generators in one 150-foot-high, 2036-foot-long powerhouse located on the south bank of the Columbia. In this respect, the Chief Joseph plant differs from that at Grand Coulee with its two stations which nestle almost inconspicuously one against each end of the mighty monolith. At Bridgeport, the single long powerhouse, nearly parallel with the river, is almost as imposing as the dam. The generating units are to be served by 27 penstocks, each 25 feet in diameter, extending from a 140-foot-high concrete intake structure on a line with and towering above the power plant and amounting, in effect, to a downstream extension of the south end of the dam. The Chief Joseph powerhouse has been planned to accommodate more generating capacity than any now in service.

Columbia River Constructors began operations in April, 1952, and estimated work was 77 percent finished in June of this year, some phases eight months ahead of schedule. At present the station will be only 1540 feet long, and only sixteen of the ultimate turbogenerators will be installed. The intake structure, however, is being carried to its full 27-unit length. Completion of the power plant is contingent on the development of upstream storage, which is to be obtained principally by building Libby Dam on the Kootenai River in Montana.

Concrete required for the two main structures on this contract amounts to 870,000 cubic yards, as compared with 981,000 for the main dam, and reinforcing steel totals 37,100,000 pounds, or nearly eight times the quantity in the dam. Though Chief Joseph Builders did most of the excavating for the powerhouse and intake, Columbia River Constructors have to handle an additional 286,000 cubic yards of rock, including 150,000 cubic yards in removing the cofferdams. Suitable aggregates are produced under subcontract in a screening and washing plant on the north bank of the stream below Bridgeport by J.G. Shotwell, of St. John, Wash., and are stock-piled there and trucked to a Columbia River Constructors concrete plant located near the downstream end of the intake structure. It has a capacity of 4000 cubic yards in 24 hours. Permanente cement is principally used, supplemented with some Superior, and is transported by water from San Francisco to Seattle, from there over a Great





TURBINES TAKE FORM

Scroll cases for the turbines are being assembled at the right. In the left foreground is a Gyro-Flo 125-cfm portable compressor that furnishes supplemental air for the work. Above is a close view of a scroll case and a section of 25-foot penstock that will feed water to it.

VARIED USES OF PNEUMATIC TOOLS

1 Riggers clearing away a network of supporting steel, called a "spider," from the interior of a finished penstock. The man in the center is using a Size 534 Impactool.

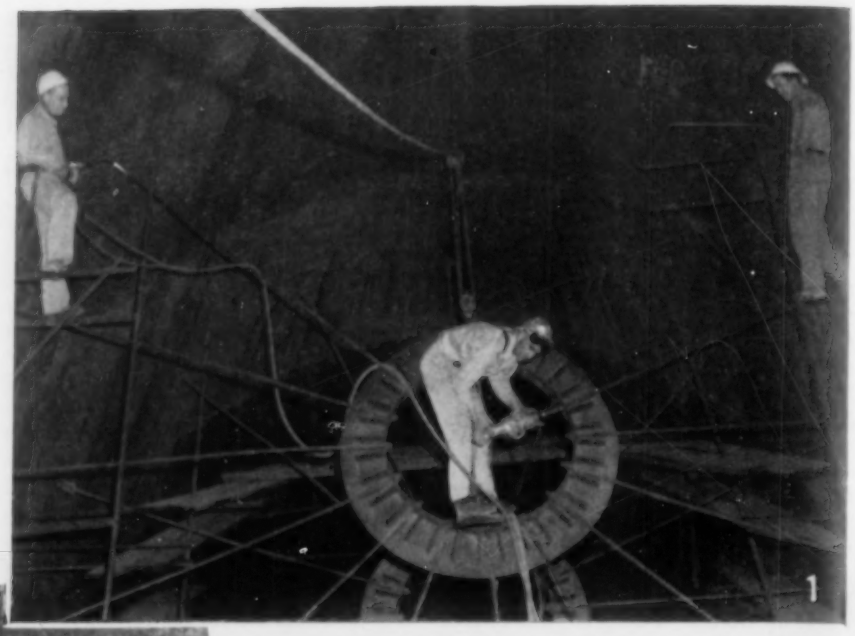
2 A hooded sandblaster cleans the steel guides for the main gates of the intake structure.

3 A faithful watchdog. An unattended, small air-operated sump pump removes water that accumulates at the lower end of a penstock during a pressure test for leaks.

4 Drilling holes for the placement of bolts in an expansion girder ring.

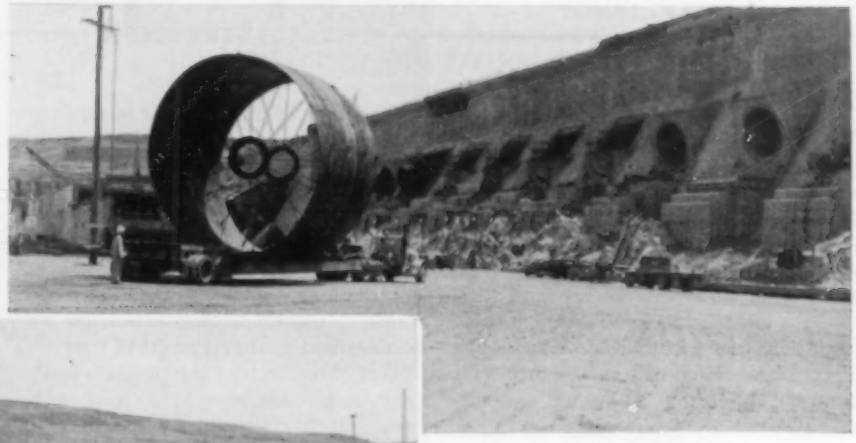
5 Tightening bolts on the huge rotor of a generator with a Size 555 Impactool.

6 A workman using an I-R chipping hammer to dress a concrete surface.



GROANING TRUCKS

Loads like these might have stumped Paul Bunyan, but modern motor equipment moves them handily. The dished structure at the bottom is the steel skin for a spillway gate en route from the fabricating yard to the job site. The other view shows a section of penstock with its interior supporting web waiting at the powerhouse to be put in place by two revolving cranes.



ARMY ENGINEERS PHOTO

Northern branch line to railhead, and then by truck 10.8 miles to the dam.

Concrete is delivered to the pouring sites by 4-cubic-yard hand-dump buckets placed on special standard-gauge cars, each carrying three, pulled by four General Electric diesel locomotives. One of the two concrete haulage tracks is on the same 70-foot-wide service deck that runs between the powerhouse and intake structure and supports rails for two Washington Iron Works whirleys (revolving cranes). The other one goes to the intake and is at a higher elevation. The concrete moved over the latter is handled by a giant 12-yard Bucyrus-Erie Monighan crane that is equipped with a 200-foot boom and travels on four rails on a separate level. Concrete required inside the power plant and at many isolated points is delivered in buckets transported singly by Euclid trucks. Supplementing the Monighan and whirleys, concrete for penstock sections and other materials are handled by a 50-ton Star Iron & Steel gantry crane permanently installed on top of the intake structure, two Judson-Pacific overhead cranes in the powerhouse, a 4500 Manitowoc and by various truck cranes.

Equipment driven by compressed air is not so much in evidence now as when Quarrymasters, wagon drills, and Jackhamers were utilized during earlier stages when excavating was at its height. However, a total of 6200 cfm of air is still available and is supplied by three Ingersoll-Rand PRE synchronous motor-driven machines in a central plant. Miles of lines extend to areas wherever routine work such as sandblasting and nut running is in progress and where air is required for special applications such as testing the huge penstocks for leakage.

Some 6000 tons of steel plate varying in thickness from 1 to nearly 2 inches is needed for the penstocks. This is being made by Consolidated Western Steel Company; erected under a subcontract by American Pipe & Construction Company; shaped in Consolidated's San Francisco plant; and shipped to American Pipe & Construction's yard at railhead where it is fabricated into sections up to 32 feet long that are trucked to the job on special carriers.

John Volpe is general superintendent for American Pipe & Construction, Frank Harvey is fabricating superintendent and Ted Sherwood is erecting superintendent. The generators are being furnished and installed under a prime contract by Westinghouse Electric Corporation, with Jack Berry, general superintendent, in charge of operations. Newport News Shipbuilding & Drydock Company is supplying the first ten turbines and the second lot of six is to be provided by S. Morgan Smith. Bigge Crane & Rigging, of Oakland, Calif., is setting up the embedded parts of the turbines under a subcontract, the work being under the direction of Paul Grove, general superintendent. Reinforcing steel is being manufactured and placed, also under a subcontract, by Rutherford & Skoubye, of Oakland, and Steel Construction Company, Portland, Oreg., a joint venture, with Harvey Rutherford as superintendent.

Columbia River Constructors are currently employing about 1100 men on a 3-shift schedule, and other firms have sizable payrolls. Project manager is George Piedmont, a 26-year Morrison-Knudsen veteran. Arthur W. Campbell, Jr., is project engineer; Stanley Stearns is office engineer and P.A. (Tony) Campbell is office manager.

The last prime contract awarded by the Army Engineers amounts to $3,424,-521 and is held by the Gunther & Shirley Company and E.V. Lane Corporation, Palo Alto, Calif. It covers the installation of all powerhouse equipment and appurtenances except generators and work on it is just getting underway with Forrest Riskin serving as general superintendent and Bill Donaldson as chief engineer.

The Columbia is our second-largest river; only the Mississippi below St. Louis carries more water. But visitors from the eastern states are often disappointed in the Columbia's apparent size, not realizing its depth and rate of flow. Studies indicate that it is perhaps the earth's greatest potential source of hydroelectric energy. The primary purpose of the Chief Joseph development is the production of power, for which our industries in the Northwest seem to have an insatiable appetite. From experience gained at Bonneville and Grand Coulee, it is estimated that the sale of electricity will repay the cost of the Chief Joseph Project—some $200 million—in considerably less time than the 50 years originally forecast.

In compliance with demands made by the U.S. Bureau of Reclamation, irrigation outlets are being provided on both sides of the stream to serve lands along the Columbia below the dam and along the lower Okanagan River. Furthermore, the recreation potential of the lake that will be created by the dam is not being lost sight of, and the Washington State Parks and Recreation Commission is working on plans for a 280-acre park.

The Chief Joseph Project is under the supervision of Col. N.A. Matthias, district engineer for the Corps of Engineers, U.S. Army, at Seattle. C.H. Wagner is resident engineer.

Editorials

FOR CLEANER AIR

IN THIS issue is the first of two articles dealing with the extraction from the atmosphere of contaminants that are deleterious to humans and machines. Humans fortunately are equipped with a hirsute filtration plant in the nostrils, but, like all filters, this one becomes overloaded under extremely unfavorable conditions and it is sometimes necessary to give it artificial help in the form of a mask or respirator. Mankind can survive surprisingly severe exposures to grit and grime unless the silica content is great enough to be damaging to the respiratory system. Machines, on the other hand, deteriorate rapidly if abrasives get on sliding surfaces, and reciprocating engines and compressors are especially vulnerable. Hence the painstaking efforts taken to exclude foreign matter from their air supply.

Most of the contaminants are, of course, put into the atmosphere either directly or indirectly by man and are for the most part products of our intensive industrial activity. If these offending materials could be whisked away in some magical manner, most of the problems they create for man and machines would also disappear. Such a broad solution of the situation is the aim of researchers at New York University. Their principal tool is a 42x84-inch wind tunnel. With it they are trying to find ways of sending air-borne industrial wastes high enough to disperse them over a wide territory. Currently, as reported to the American Society of Mechanical Engineers by Dr. Gordon H. Strong, professor of aeronautical engineering at NYU, they are studying the Avon Lake Village (Ohio) thermal power plant of the Cleveland Electric Illuminating Company.

As is the case at most power stations, the most obnoxious component of the Avon Lake stack gases is sulphur dioxide. A model of the plant was studied in the tunnel under variations of wind speed, wind direction, stack-gas density, and gas-ejection speed to determine the circumstances under which the simulated gas reached the ground. Wind direction was changed by revolving the model of the powerhouse and the surrounding community on a turntable. These results were then compared with field tests.

It was established that the down-wash (downward deflection of the air stream) increased with higher wind speed and lower stack gas-ejection speed, that pollution was greatest when the wind was about 45° off the line of the stacks, and that 19 miles per hour was the critical wind speed. It was revealed that at higher wind speeds contamination from the stacks reaches the ground where the build-up is extremely rapid.

The crux of the problem would then seem to be to develop means of reducing the down-wash. Various methods of accomplishing this were studied, including the use of higher stacks, nozzles or vanes on the stacks to guide the gas, diluting the gas with air to increase its speed, streamlining the station, and even using vanes to correct unfavorable wind patterns caused by the structure of the plant.

Out of research endeavors such as this may come knowledge of inestimable value. If "bad" air, like bad men, can be summarily evicted from communities where people live and machinery operates, life will be easier alike for women who now subject their spotless wash to the soot and sulphur that are born of coal combustion and for engineers who are responsible for keeping costly mechanisms free from the scouring and chemical action of air-borne pollutants.

INDUSTRY ASEA

FISHING, one of the oldest industries, is benefiting from modernization. New methods of locating and catching fish are increasing the yield, new ways of preserving it and preparing it for the market are gaining customers, and improved equipment and more efficient management are cutting costs.

The industry is alert to the possibilities of research, and is beginning to make it pay off. Illustrative of this trend is the effort being made to develop shrimp fishing in North Atlantic waters. This has been stimulated in part by the recent decline of the shrimp harvest in the South. Previous surveys showed that these shellfish were abundant off the New England Coast, although of smaller size than Americans are accustomed to. Many northern fishing boats could be readily and inexpensively equipped for shrimp fishing; in fact, some have been going down to the Gulf of Mexico in the wintertime to fish for shrimp. The industry hopes to get Federal funds with which to conduct new surveys to determine the extent and location of the New England shrimp beds.

Shrimp fishing in the North will not be an innovation. Clarence Birdseye, frozen-food pioneer, processed some shrimp that were brought in by Gloucester fishers prior to 1927, and sizable catches were made off Maine from 1933 to 1945, after which they steadily declined. It is believed that the beds are still there but have perhaps shifted.

Shrimp research in the South has taken the form of looking for ways to detect the crustaceans. On the Fish and Wildlife Service's research boat *Pompano*, operating out of Key West, Fla., experiments have been conducted to determine whether or not shrimp make any distinguishing sounds. A hydrophone was placed in a wooden tank with 100 shrimp, and at various times during the night someone listened in on the earphones. Nothing was heard until the shrimp were fed, when clicking, grating and rasping sounds were audible. Many of the shrimp were observed to be eating, so it was apparent that the noise was associated with it. These tests indicate that there are possibilities of locating beds with listening devices.

At the annual convention of the National Fisheries Institute, the rocket-like rise in popularity of fish sticks was a leading topic of discussion. These square sections of boned fish were mentioned in our article on frozen foods last July. They are processed either as a fresh raw filiet or breaded and cooked. People who normally pass up fish because they are afraid of the bones seem to have no such inhibition in this case, and sales, which reached seven million pounds in the first year, continue to grow unbelievably.

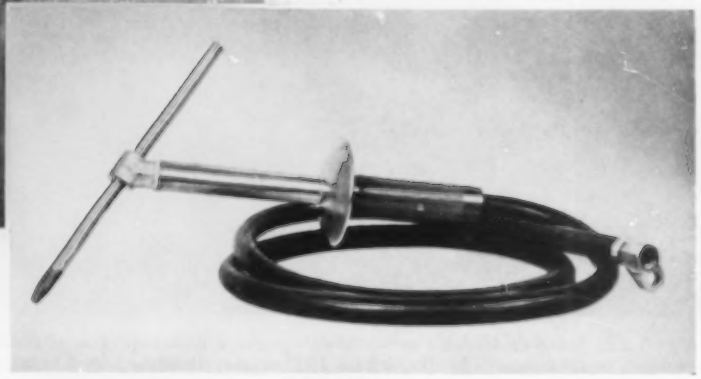
The sticks are cut from molded fish blocks, which are far from new, having been made by Birdseye in 1925 when he was first experimenting with frozen foods. He also produced frozen fish steaks, but abandoned both products when he encountered problems in dehydration. Twenty years passed before the new idea of sawing the blocks into smaller portions was tried out in 1948, and several more years were spent in developing mass production techniques. So far only Atlantic fish such as cod, haddock and pollock have been processed as sticks, but Northwest fisheries are interested in using salmon and halibut.

It is customary to think of fish as a source of human food, but they are also important for other purposes. Last year, for example, the catch of menhaden, which is too bony and oily for people to eat, totaled a staggering 1,670,888,200 pounds. It was the largest take of a single species ever registered in the United States and accounted for 40 percent of the yield of fish and shell-fish. The 1953 catch was converted into 174,000 tons of dry scrap and meal, nearly 19 million gallons of oil and 78 million pounds of condensed fish solubles, with an aggregate value of more than $34 million.

Following a 5-year experimental program, Fish and Wildlife Service specialists stated that many advantages would result from freezing fish on the boats. The vessels could then stay out until they had a full haul, and all cleaning operations could be conducted on shore with consequent savings in and utilization of byproducts and pharmaceuticals from some parts that are now discarded.

TORCH IN USE

Shown here is a worker in the shop of the Olympic Welding Company gouging out a groove between square-butted tank sections preparatory to welding them together. The operator regulates the air pressure by a control lever concealed by his gloved hand. Both compressed air and electricity are delivered to the tool through the single concentric cable. In the new model Arcair torch (below) the air jets are in the head that holds the electrode at a fixed angle. When the latter is inserted the air valve is turned on automatically and remains on until the electrode is withdrawn. Air at from 80 to 125 psi is used to do the cutting or gouging and is supplied by a compressor such as is usually installed in metal-fabricating shops for general service.



Air-Electric Torch Cleans as It Cuts

A SIMPLE application of compressed air lies behind the development of a tool that is being used increasingly in metal fabricating plants, maintenance shops and by metal workers generally for cutting and gouging out metal and for minor metal removal jobs. Known as the Arcair torch, it is similar in appearance to an ordinary welding-rod holder but differs greatly in principle, purpose and design. In the head are two small jets through which air at a pressure of 80-125 psi is directed toward the tip of the electrode. The air blows away the metal which has been reduced to a molten state by the heat of the arc, leaving a clean gouge, groove or cut free from slag and ready for welding, rewelding or further work.

The tool is easy to use, as there is only one control, that for the air, to worry about. In fact, on the latest heavy-duty model even that is dispensed with because the air valve is in the "on" position as long as the electrode is in the head. Inserting the electrode turns on the air, which remains on until the electrode is withdrawn. The combination of compressed air and intense heat enables the torch to bite quickly and with equal effectiveness into iron, steel and alloy steel, as well as into clad metals.

Although looked upon primarily as a maintenance tool, experience has proved that the Arcair torch can be used to advantage also in production work, and it has therefore led to the development of a new technique in metalworking shops. It has resulted, for example, in a method of fabricating metal plates that virtually eliminates prebeveling, normally one of the most expensive and troublesome steps in operations of this kind. Until now, plates to be joined, particularly those of any appreciable thickness, had to be beveled before welding so as to insure the necessary penetration. That was especially difficult when two curved or formed plates had to be joined because the bevels had to be accurate and straight.

With the Arcair process, this step is eliminated. The plates to be welded are now put immediately in the assembly jig and, after a light tack on the back with a welding torch, the new tool gouges out a groove at the juncture. This accomplishes the same thing as beveling, but without its disadvantages—setup time, expensive cutting machines and possible inaccuracies. The shop foreman at the Olympic Welding Company in Seattle, Wash., has reported that the method, applied to the fabrication of mild-steel tanks, has generally effected a saving of up to 20 percent in assembly time and does a better job, actual cutaway and stress tests showing penetration superior to that of welds made in the conventional way.

The Structural Division of Pacific Car & Foundry Company in the same city is another user. Some while back, it was faced with the problem of removing faulty welds in mild steel plate 2 and 3 inches thick. Upon trying out the Arcair torch it was found to be so effective that it is now a feature of the welding procedure in its metal-plate fabrication plant. The concerns mentioned are but two of many that have learned that the compressed air-electric process of metal cutting can play a vital part in speeding up production and lowering operating costs.

Circle 1E on reply card

Plastic sheet material is hard to wind because it stretches. If too little tension is applied in reeling measured lengths from a let-off roll onto the receiver roll, it causes "crush"; if too much is exerted, corrugations result. Even the width of the roll may be affected. To overcome the difficulty, Link Engineering Company has designed a device that measures and controls tension and is said to give good service. A nondisplacement instrument, it makes use of a sensing element that produces a pneumatic signal in proportion to the tension in the web. This signal is picked up by the controller and serves to operate the brake on the let-off roll through the medium of a diaphragm, thus maintaining constant balance. Called Lod-Cap Tension Controller, it stops the system should the web break.

Circle 2E on reply card

Some of Codell's crews work against a backdrop of steel construction as wagon and hand drills bite into the limestone. The Bethlehem Hollow was furnished by Contractors Service and Supply Co., Winchester, Ky.

3½ Million Cu Yd Excavated For G. E.'s Appliance Park

A huge manufacturing plant, in itself a major industrial center, is nearing completion under the supervision of General Electric Realty Corp. at Buechel, Ky., southeast of Louisville. Called Appliance Park, it is dominated by five main plant buildings, and will be operated by General Electric Company for the manufacture of major appliances.

Clearing and leveling the sloping 1000-acre site upon which Appliance Park is situated was no easy task, for it called for the removal of 3½ million cu yd, a portion of which was hard limestone.

This phase of the job was handled by Codell Construction Co., Winchester, Ky. Codell used Multi-Use steel bits on rods of 1 in. and 1¼ in. Bethlehem Hollow Drill Steel, and drilled blast holes ranging in depth from 2 ft to 20 ft. Bethlehem Hollow was used exclusively in this important construction project.

Left to right: W. F. Conlin, *project manager,* Turner-Struck Construction Co., *general contractor;* D. K. Shore, Bethlehem Steel Co.; Geo. M. Eady, *president,* Geo. M. Eady Construction Co., *utilities contractor;* W. O. Billiter, *superintendent,* Codell Construction Co.

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Circle 17A on reply card

This and That

Unusual Use for Mirrors

In Civil War days, not long after the original Drake oil well was drilled in Pennsylvania, petroleum was "mined" in Ventura County, Calif., by draining it from tunnels driven into a mountainside. Some of the bores were 700 feet long, and by 1896, according to *Oil and Gas Journal*, were producing 1000 barrels per month. Because explosive natural gas was present, open lights could not be used, and safety lamps were not available in those days. The difficulty was overcome by arranging a series of mirrors to reflect sunlight into the tunnels.

★ ★ ★

Much Traveled Boulder

A hefty granite boulder that a glacier carried from Canada to near Coitsville, Ohio, 50,000 or maybe 100,000 years ago, has been moved twice by man's efforts during the past 35 years. In 1919, it was selected to become a memorial to 24 employees of the Youngstown Sheet & Tube Company who lost their lives in World War I. By means of skids, a truck and a traction line's construction car it was transported to a company-owned park and provided with bronze tablets affixed to opposing sides of it. When company activities were shifted to another park, the stone was left behind but the plates were removed and fittingly mounted at the new location. While seeking something of the kind (Ohio has no native stone of this sort), Youngstown College learned of the boulder's existence, made arrangements to acquire it and moved it to the campus, where it now serves as a memorial to the class of 1949.

★ ★ ★

New Way to Upgrade Iron Ore

A variation of the flotation process is being used successfully by Humboldt Mining Company, near Ishpeming, Mich., to concentrate low-grade iron ore produced on Michigan's upper peninsula. This ore differs from the much publicized taconites of the Minnesota iron ranges. Its mineral is disseminated through jasper rock and is not magnetic. Consequently, it cannot be separated by a magnetic process. The method worked out is to put the crushed ore in a tank with water and chemicals and agitate the mixture with compressed air. The iron particles attach themselves to bubbles of air which rise to form a froth on the surface. This is skimmed off and the moisture extracted to leave a concentrate that is reported to carry considerably more iron than the Lake Superior ores steelmakers normally use.

Announcement of the new process was made by the Ford Motor Company, which is coöwner of the Humboldt operation with Cleveland-Cliffs Iron Company. Existing facilities can treat 250,000 tons annually and are soon to be doubled. The Ford firm is already using some of the concentrate in its steel mill at Dearborn, Mich.

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Radar 'Islands' Planned

The Air Force has disclosed that it will build a series of structural steel "islands" along the Atlantic Coast from Virginia to Newfoundland to serve as radar observation stations designed to report on the movements of planes approaching our shores. This service is now being performed by picket ships, which will be replaced to effect economies.

The "islands" will be erected at points along the Continental Shelf where the water is less than 100 feet deep. Some of them will be as much as 125 miles at sea. They will be supported on 6-foot-diameter steel caissons that will be driven into the sea bottom and filled with concrete. The platform elements of each structure will be a compartmented steel barge that will be towed to location, carrying its caissons and the necessary construction equipment as cargo. The caissons will be lowered to the bottom through wells in the barge and the barge will then be elevated above the wave level of the sea simply by manipulating pneumatic jacks at the tops of the caissons.

This procedure was worked out by Col. Leon B. DeLong, head of the DeLong Engineering and Construction Company, of New York, and was first successfully used to build a pier in the Orinoco River in Venezuela from which iron ore is loaded into boats for shipment to the United States by the Orinoco Mining Company, a subsidiary of United States Steel Corporation. Since then other similar platforms have been erected in the Gulf of Mexico from which to drill offshore oil wells. Because of this service, the units are known as "Texas towers."

The operation of the air jacks for lifting the barge clear of the water was described in detail in our November, 1952, issue. In general, they climb the pipes in much the same manner as a boy "shinnies" up a tree. Each jack consists of a series of inflatable gripping tubes surrounding the pipe, and a single large air cylinder.

The completed "islands" will each have a surface area of around 15,000 square feet and carry a tall radar tower and housing accommodations for a crew of 20 to 30 men. There will also be a "heliport," as personnel and materials will be transported by helicopter. One DeLong barge is now out making tests of the bottom to determine suitable location sites where the permanent structures will later be built under contracts. The Air Force estimates that each one will cost $750,000, exclusive of radar equipment, and that the total construction cost will run from $15 to $20 million. This would indicate that from twenty to twenty-five stations are already in the planning stage.

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Rather Doggy, We Say

Tops among the many unusual applications of compressed air we know of is one thought up by William D. Hay, a mechanical engineer with General Precision Laboratory, Pleasantville, N. Y. At his home he uses a jet of air to clean the dog's feet before the animal enters the house. Moreover, Mr. Hay has figured out a device that will enable the pooch, after a little instruction, to perform this valet service for himself. So far he hasn't found time to rig it up.

The air comes from an Ingersoll-Rand 2-cylinder, receiver-mounted Type 30 compressor that is used primarily for spraying paint, cleaning upholstery of the family car, opening the garage door and running tools in a hobby workshop. Incidentally, Mr. Hay informs us that he has been reading COMPRESSED AIR MAGAZINE for 22 years and has kept every issue during that period.

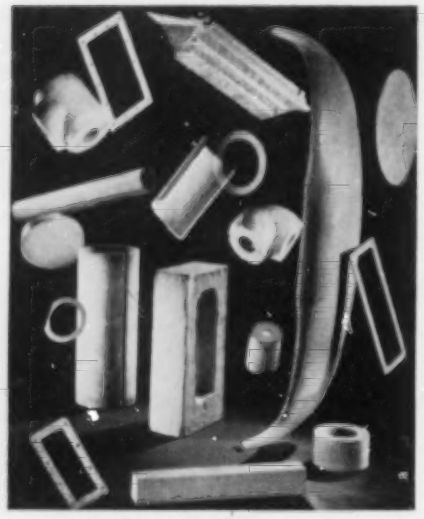
★ ★ ★

Shoos Roosting Birds

Starlings, pigeons and other unwanted birds can be dissuaded from roosting on window sills, rain troughs or roof tops by the application of a clinging gelatin compound that is now available in push-button-actuated, gas-pressurized aerosol dispensers. The new product, which issues as a ribbon of foam, doesn't harm the birds, but is so disagreeable to them underfoot that they shun it. It is odorless and harmless to human beings, doesn't wash away, is non-flammable and stainless and blends in with the color of painted surfaces within a short time. It is claimed to be effective for a year or more if properly put on. Outside building maintenance contractors have been applying it with caulking guns for five years, but it has not previously been sold in a form convenient for use by home owners. It goes under the trade name of "Roost-No-More."

Industrial Notes

Glass Wool Molded into Serviceable Forms



A NEW industrial material that has varied applications is made by molding fluffy Fiberglas insulating wool under heat and moderate pressure. The product is firm but not rigid and combines structural strength to resist considerable shock with resilience to cushion delicate articles against breakage when used as a packaging material. Like other forms of Fiberglas, it will not rot, burn, absorb moisture, shrink or stretch. Birma Manufacturing Company, the principal molder, turns out the diversity of shapes pictured. Among them are gaskets, motor mounts, an automotive-instrument panel board, filters, a baffle for an air-conditioning unit, and preformed insulation for pipe lines. Molded Fiberglas comes in densities up to 20 pounds per cubic foot, at which stage it resembles wood. Curing cycles are from 20 seconds to several minutes.

Circle 3E on reply card

Aluminized protective clothing is the latest thing for workers on hot jobs, according to American Optical Company which is making all the standard garments worn for the purpose either of aluminized asbestos or duck. By the new process of manufacture the metal becomes an integral part of the fabric and therefore permits flexing without cracking or peeling. Other claims made for it are that it is lighter than the familiar materials and reflects 90 percent of radiant heat.

Circle 4E on reply card

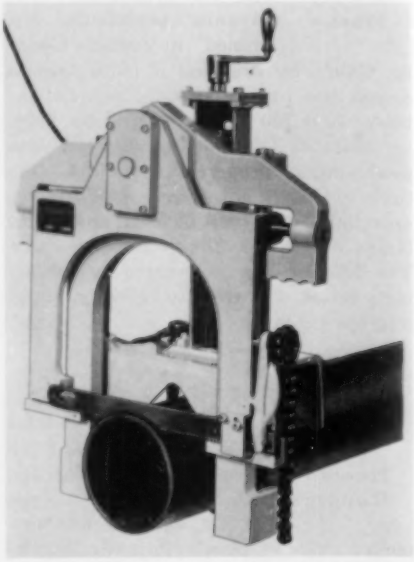
Reporting on tests of a new water resistant magnesia insulation, an independent laboratory claims that it showed no loss in insulating value after 378 hours in boiling water with time out intermittently for drying. According to The Magnesia Insulation Manufacturers' Association the product is offered for use where moisture conditions are severe.

Circle 5E on reply card

A formula for an aerosol paint remover may be obtained free of charge from the du Pont Company. Of the foaming type, it is said to work faster and to be cleaner and more active than those applied by brush. It is said to be suitable not only for enamels and nitrocellulose lacquers but especially for varnish, which is usually more difficult to get rid of than other kinds of protective coatings.

Circle 6E on reply card

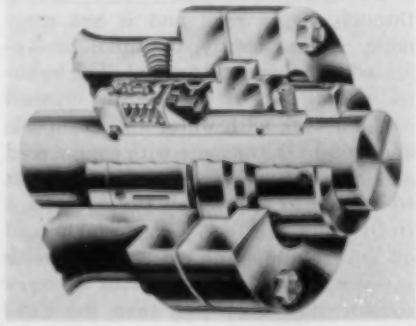
Power Saw Cuts Pipe in Narrow Trench



CAST-IRON or steel pipe from 2 to 8 inches in diameter and having wall thicknesses up to ½ inch can now be sawed in a trench no wider than 25 inches by a power machine. Called the Wachs Guillotine Pipe Saw, it weighs 120 pounds and is available for operation by an air or an electric motor. It can be clamped to the pipe by means of a chain-type vise in a matter of seconds, and a steel V-saddle base holds it so as to assure a square cut at right angle to the pipe length. The 12-inch blade has a 2-inch stroke and averages 25 cuts between sharpenings. The saw is said to cut a 6-inch standard-wall cast-iron pipe in four minutes and a steel one of the same size in eight.

Circle 7E on reply card

Crane Packing Company has announced a newly designed mechanical shaft seal for split-case pumps. An adaptation of its Type 9 Seal, it is mounted on a sleeve with an outside clamping ring that permits quick installation or replacement without unbolting the top of the horizontal split shell. Flexible sealing members are made of chemically inert du Pont Teflon and springs and



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PRESSURE SWITCH
(cutaway view)
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HAZARDOUS LOCATIONS
THESE FEATURES
ADD UP TO A BETTER SWITCH:
• 200 lb. range and usual differential for air compressors and pumps
• Tamper-proof adjustment
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• Externally mounted release valve protects against corrosion of internal parts
Also available in WATER-TIGHT construction
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Address Square D Company,
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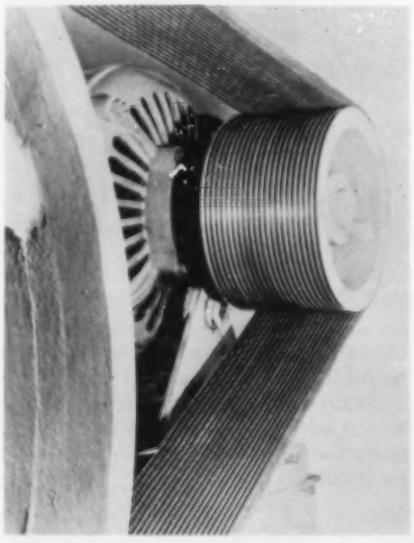
SQUARE D COMPANY

Circle 18A on reply card

metal parts are supplied according to metallurgical specifications, permitting the use of the seal with virtually all corrosive liquids at temperatures to 500°F. In reporting on the performance of the new seals on all cargo pumps on a tanker plying between Pennsylvania and Texas ports, the company states that inspection after eleven round trips showed that "there had been no leakage whatsoever."

Circle 8E on reply card

Belt-matching problems common to multiple V-belt applications are eliminated by Poly-V Drive, a single endless rubber belt introduced by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., as a significant departure in power transmission. Molded lengthwise on the inner surface is a series of parallel V-ribs that mate exactly with the sheave grooves; crosswise there is an uninterrupted high-strength member of synthetic cords that extends the



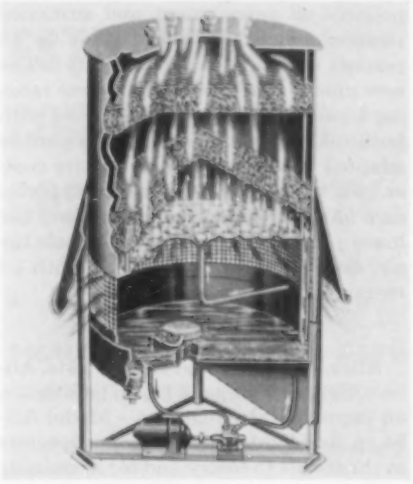
full width of the belt. A feature of the new design is that the load is distributed equally over the entire driving surface, thus providing twice the usual traction contact area and therefore as much as twice the horsepower capacity per inch of sheave width. Other advantages claimed by the manufacturer for Poly-V Drive are: long belt and sheave life because of a considerable reduction in face pressure; prevention of belt turnover in sheaves; cool and smooth running; and economy in inventories because two cross sections—Nos. 187 and 375—meet all drive requirements.

Circle 9E on reply card

Seecloth is the name of a chemically treated fabric put on the market by Hygiene Research, Inc., for cleaning and, at the same time, mistproofing lenses, windshields, and other transparent surfaces that should be kept clear for safety. With care it can be used for half a year and more, and plastic or glass remains clean and mist free for a period ranging from a few hours to two weeks, depending upon atmospheric conditions. The cloth is especially useful to men working over steaming vats or in confined places such as boilers or tanks.

Circle 10E on reply card

To its line of Cycoil oil-bath air cleaners, American Filter Company, Inc., has added a new low-resistance type for engines using turbochargers or pressure blowers for scavenging. It is based on a new principle by which the dust-laden air first flows through metered orifices in a horizontal plate that is kept flooded with oil pumped to a central distributor head from a reservoir beneath the plate. In its passage, the air picks up



enough oil to wet the dust. Next, it enters a cone-shaped filter that causes the drops of oil to move to the outer edges which extend into an annular chamber beyond the range of the air stream. The oil, carrying the solids, flows back into the reservoir where the dirt settles as sludge. Any oil mist not caught in the conical separator is trapped in a secondary filter. For variable-speed engines, the holes in the plate are covered with hinged valves that are actuated by the air stream and maintain a constant ratio of orifice opening to air velocity. The result is said to be

DIG DEEP------CARRY FAR

Slackline builds cofferdam across river gorge.

900-ft. Tautline conveys 4-cu. yd. bucket to dam site.

One man controls . . . a Sauerman Slackline or Tautline Cableway . . . that can reach out 1,000 ft. or more. The Slackline is unexcelled for deep digging, especially under water. The Tautline is best for long range aerial crane work.

Sauerman machines lift, haul and dump any bulk material. Installations span pits, ponds, rivers or canyons. Slackline sizes: 1/3 to 3 1/2 cu. yds. Tautlines: up to 25 tons. Operation cost: just a few cents per cu. yd. handled. Consult Sauerman engineers for specific information on your particular requirements.

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548 S. Clinton St., Chicago 7, Ill.

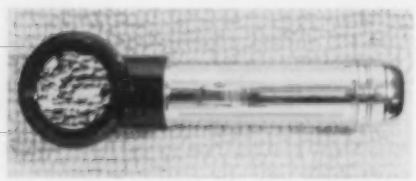
ONE MAN MATERIALS HANDLING
SAUERMAN BROS., INC.

Circle 19A on reply card

positive oil entrainment and sustained cleaning efficiency from as low as 10 percent of rating to full capacity. The new unit is available in eight sizes ranging from 1100 to 21,000 cfm. Used with both oil and water, the system can be adapted to serve as an evaporative cooler. In that case, two perforated plates and filters are mounted in series: the lower plate flooded with water cools the air, and the upper one bathed with oil removes the dust and grit.

Circle 11E on reply card

After laboratory and service tests, Abbeon Supply Company has in production an improved Flash-O-Lens—Model AB-54, a flashlight designed for inspectors in the textile industry and for examining



printing and objects too small to be observed carefully with the naked eye. The new instrument combines a 7-power Bausch & Lomb magnifying glass with an intense light built into the handle to spotlight the enlarged field of vision. The lens system is set in a plastic housing that permits placing the eye directly over the work to be checked or counted. The battery casing is of chrome-finished steel. Units for 5-, 20- and 40-power magnification are available.

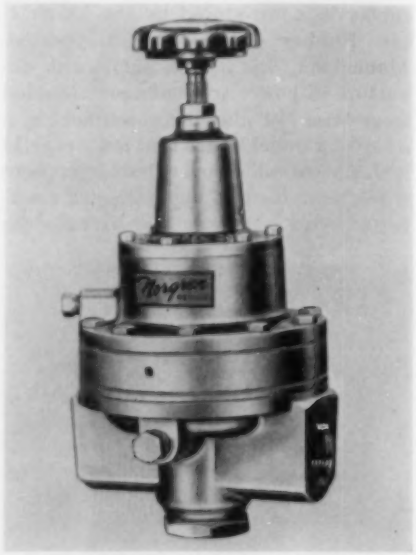
Circle 12E on reply card

Testing of instrument lines, tank bellows, castings and a variety of other parts for tightness is simplified, it is claimed, by a new leak detector that obviates immersion and drying to prevent corrosion. The unit is mounted in a case so it can easily be carried to the trouble spot and is made ready for service by connecting it to a shop or instrument line supplying air at 15-150 psi. The system or equipment to be tested is put under 10-30 psi pressure, and any drop from the preset value is recorded by means of a pneumatic amplifier of high sensitivity. Leaks can be located, repaired and rechecked without disconnecting the detector.

Circle 13E on reply card

Shipments of excavating and earthmoving equipment in 1953, excluding power cranes and shovels and all but the larger types of rock drills, were valued at $612 million, according to the Bureau of the Census, U. S. Department of Agriculture. This was a slight decrease from the 1952 total of $623 million. Machinery mounted on crawler-type tractors gained 3 percent, but wheel-type off-highway units dropped from $60 million to $44 million. Power cranes and shovels worth $253 million totaled 9717 units. Portable well and blasthole drills were valued at $8 million, compared with $7.1 million in 1952.

In one unit, C.A. Norgren Company has combined a pilot regulator and a pressure regulator designed for precision air control over a wide operating range. The pilot of the new Series 20AC00 has a light instead of the usual heavy adjust-



ing spring and uses controlled pressure to reduce line pressures up to 400 psi to uniform working pressures ranging from 2 to 120 psi. It is available in ½-, ¾- and 1-inch sizes. A companion regulator of the same type is obtainable with a remote control unit.

Circle 14E on reply card

Air-Mite has announced a new combination air filter-regulator-oiler developed for a maximum operating pressure of 160 psi. Instead of the conventional

J. Tinkerboy Lazybones modernizes the old rocking chair

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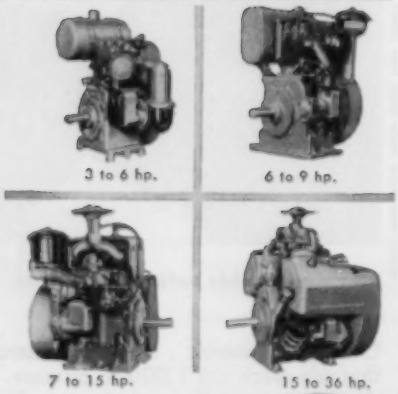
HEAVY-DUTY Air-Cooled ENGINES

3 TO 36 HORSEPOWER



In the design, manufacture, and ultimate use-purchase of mechanized field and industrial equipment . . . Wisconsin Heavy-Duty Air-Cooled Engines are specified as Original Equipment Power Components to a greater extent than any other make of engine, within a 3 to 36 hp. range.

This dominant preference must necessarily be based on actual *performance records* of users . . . because Wisconsin Engines are not sold on a "price" basis. These engines have the inherent Lugging Power that *stays with the job*, eliminating "stop-and-go" delays, saving manpower and manhours . . . and delivering "Most H. P. Hours" of on-the-job service, with minimum servicing.

If this makes sense to you, let's get together. Write for engineering and descriptive data.

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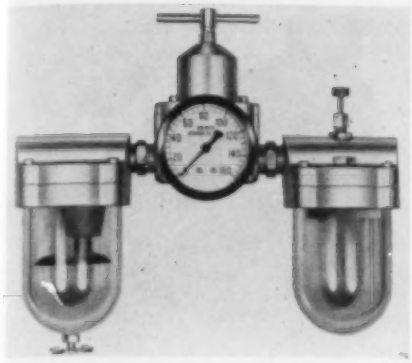
Circle 20A on reply card



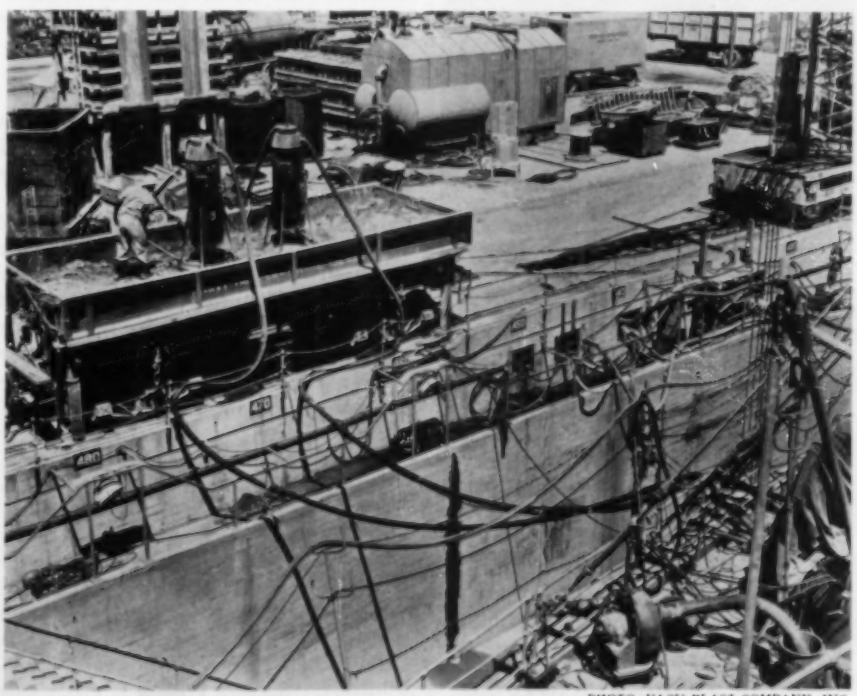
diaphragm it has a piston cup that is said to assure instantaneous response, and it also features a cone-shaped filtering element that is made of sintered bronze for permanence and that is provided with an integral air baffle. The filter is easily removed for cleaning. Lubricant injected into the air stream is preatomized, and balance between the oil supply and air flow is maintained by a control valve with micro adjustment. A brass cock permits quick drainage of moisture and sediment.

Circle 15E on reply card

Residents of Alleghany County, Virginia, raised $5000 to restore the last remaining covered bridge owned by the state highway department. Built in 1835, the 120-foot span over Dunlop Creek, 3 miles from Covington, was in service until 1929 when the road that crossed it was rerouted. The span is now used only by pedestrians. Called the Humpback Bridge because of its arched floor, it is said to be the only one in the nation having that design feature.

Less than 400 of the 38,000 members of the American Society of Mechanical Engineers have been elevated to the grade of "fellow," an honor usually bestowed in recognition of acknowledged engineering accomplishments. Carroll R. Alden, a designing engineer for the Ex-Cell-O Corporation, of Detroit, Mich., was recently given that rank. He had a lot to do with the development of his firm's line of machine tools, including a high-speed air turbine-driven grinding spindle.

Rheumatism is one of the leading causes of absenteeism among employees in Great Britain and accounts for the loss of three million weeks of working time each year. The Ministry of Health reports that between two and three million persons suffer from the crippling ailment and that its cost in lost production and medical aid amounts to $700 million annually. The British Rheu-



PHOTO, VACU-BLAST COMPANY, INC.

PORTABLE PNEUMATIC CONVEYING SYSTEM

Shown here are two Vacu-Veyor units mounted on a flatcar run alongside a docked ship in the Mare Island Naval Shipyard. The vessel's tanks are being sandblasted and the equipment is removing the spent material and delivering it directly to the car for disposal. The sand is picked up aboard ship by a nozzle attached to a 3-inch suction hose and transported 40 feet vertically and 50 feet horizontally to the unloading point. Using a 20-hp motor and a 600-cfm positive displacement blower, each unit handles from 3 to 4 tons an hour. Provided with rollers, Vacu-Veyors can be moved around a plant as needed, hauled from job to job, or adapted for permanent installation.

Circle 16E on reply card

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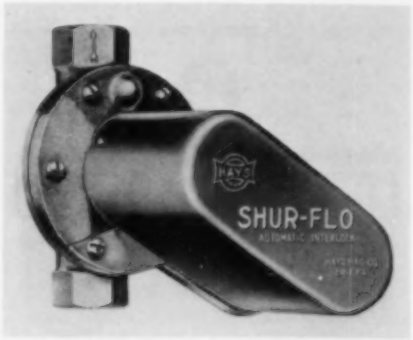
Circle 21A on reply card

matic Association, which is endeavoring to combat the disease, claims that more medical specialists are urgently needed.

For cleaning and decarbonizing carburetors, fuel pumps and other small parts, Turco Products, Inc., has developed a portable washer and special solvent that are said to do the work so thoroughly that no hand scrubbing is needed. The unit is cylindrical in form and has a capacity of 6½ gallons. Air fed through a hose connection is used to agitate the fluid and issues from eight jets in the bottom of the tank in which a wire basket holding the pieces is suspended. The jets are controlled by an air valve and reate a turbulence pattern which, according to the company, forces the solution into the tiniest openings, flushing out the dirt and scale which collects in a sump. Cleaning takes about fifteen minutes.

Circle 17E on reply card

Shur-Flo Automatic Interlock is a new safety device produced by Hays Manufacturing Company for the protection of equipment that needs a definite fluid flow to insure proper functioning and to prevent damage. The flow switch is operated through a pressure differential across an orifice and will either cut off a unit or give a warning signal whenever



the volume drops below the predetermined safe rate. It is available in ½- and 1¼-inch pipe sizes providing switch control points ranging from 0.1 through 8 gpm and from 8 through 40 gpm, respectively. Any contact point within those limits is obtained by changing the size of the orifice.

Circle 18E on reply card

Grinding and checking tools, gauges and similar parts requiring close tolerance radii has always been exacting work. Now, we are told, any mechanic of average ability can do it with ease by means of a fixture made by DeSoto Tool Company. All he has to do is to "set it up properly and the results are bound to be correct." Called the Al-Maur after its designers, Alvin L. Norgie and Maurice A. Follebout, it is said to grind all angles from 0° to 180° and radii as small as 0.001 inch, upward, to tolerances as close as 0.0001 inch.

Circle 19E on reply card

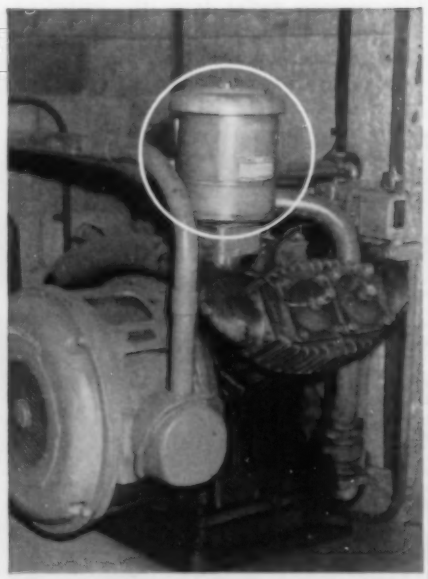
For the control of air cylinders in an endless variety of sequences, Mead Specialties Company has developed an electropneumatic timer called the Meadmatic. The unit illustrated is the Model 6, which is designed to operate as many as twelve single- or six double-acting cylinders. (Picture shows it with ten of its available ports in service.) The timer consists of a small constant-speed motor

"Because it looks more feminine, that's why!"

Whether you dig trenches, or grease garbage trucks...

Air-Maze filters will keep your compressors on the go!

DESPITE FLYING DUST AND DIRT on this trench digging job, the mobile compressor stays on the go! Its Air-Maze oil bath filter scrubs intake air clean in a bath of oil—keeps airborne dirt from damaging polished pistons, rings and other vital compressor parts. An Air-Maze lube oil filter (not visible in photo) gives added protection against breakdown by filtering all the oil all the time.



TO GREASE ITS GARBAGE TRUCKS, New York Department of Sanitation uses air suppled by this compressor. And the air's there when they need it. An Air-Maze filter-silencer helps prevent breakdowns by keeping intake air clean. At the same time it dampens intake noise. Specify Air-Maze filters on the compressors *you* build or buy.

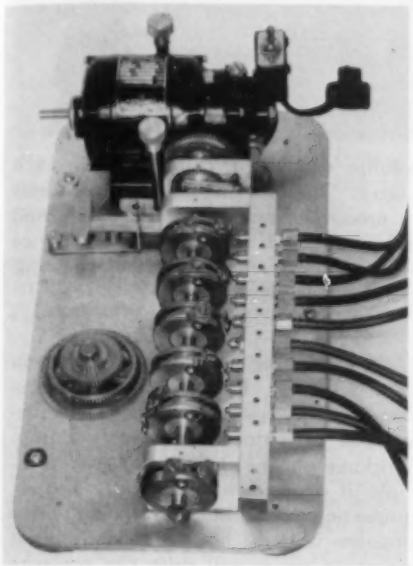
AIR-MAZE The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

25000 Miles Road • Cleveland 28, Ohio

Circle 22A on reply card

which rotates a shaft through gearing, of adjustable cams mounted on the shaft and of miniature poppet valves. The latter are tripped by the cams and send an air impulse to the main valves which actuate the cylinders. By the use of



sensitive remote-control pilot valves it is possible to mount the main valves near the cylinders, an arrangement by which a single timer may be moved to control several permanent setups merely by unplugging the pilot valves. Ten quick-change gears are provided with each unit and permit cycle-time variations from 2½ to 33½ seconds. The Meadmatic may be set for single-cycle operation or for continuous service.

Circle 20E on reply card

Condensation on the surfaces of cold-water lines with its attendant dripping can be prevented, we are told, by wrapping an asphalt-impregnated cork tape around the pipe. The material adheres without the use of fasteners and is made by J. W. Mortell Company. One coil is sufficient to cover a 10-foot length of ½-inch pipe, including fittings.

Circle 21E on reply card

To extend the field of application of its Hydro-Air Pressure Washer, D & M Products, Inc., now supplies an insulated grip for the tool so it can be used for either cold or hot cleaning and rinsing. Made of composition rubber, the sleeve slides over the metal handle and enables the operator to hold it even when it becomes heated. Also for the protection of his hands there is a rubber collar that fits over the shut-off nozzle. The washer is connected to standard air and water outlets and uses about 3½ cfm of air and 3½ gpm of water. The air serves to atomize the water, which is applied with a force that is said to remove any water-

VICTAULIC
METHOD OF PIPING

FOR GROOVED PIPE

Style 77 & 77-D

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VICTAULIC SNAP-JOINT

New, boltless coupling — hand-locks — for faster hook-ups with no loose parts. Ideal for temporary or permanent lines. Sizes 1", 1¼", 2", 3", 4".

VICTAULIC COUPLINGS Style 75

Style 77 & 77-D—The "general-purpose" couplings for standard applications. Simple, fast, reliable—sizes ¾" to 60".

Style 75—Light Weight Couplings—for low pressure, low external stress applications. Sizes 2", 3", 4".

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Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle, operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

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EASIEST WAY TO MAKE ENDS MEET!

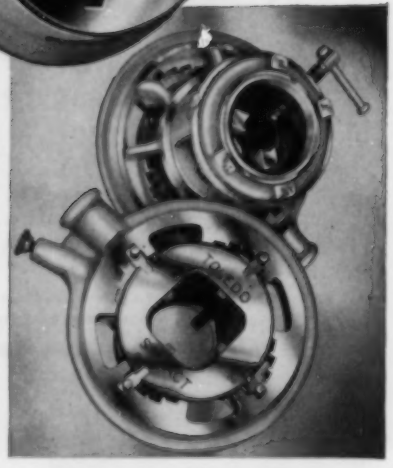
Circle 23A on rep'g card

NEW Improved TOLEDO Simpact

1" to 2" Self-Contained Ratchet Threader

WITH

CAM-TYPE PIPE HOLDER



★ *Improved* cam-type quick-action pipe holder has broader jaws for more positive grip on pipe.

★ Free action cam assures instant setting to any size—1" to 2".

★ Easy to center . . . you get perfect aligned threads.

★ Fewer moving parts . . . minimum wear . . . light in weight. Amazingly compact . . . will thread a pipe projecting through a wall as short as 6¼".

★ Accuracy proven through the years . . . dies recede along tapered steps. A fine quality tool—yet low in cost! Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER . . . *all the way!*

TOLEDO

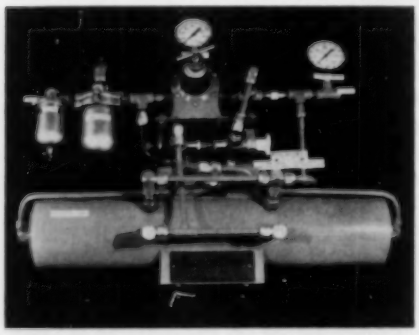
PIPE TOOLS . . . POWER PIPE MACHINES
. . . POWER DRIVES

Circle 24A on reply card

soluble dirt even from hard-to-reach places. The tool has many applications in processing and industrial plants and is widely used in garages and service stations for washing cars and cleaning parts and engines.

Circle 22E on reply card

For increasing air pressure by as much as a 2:1 ratio, Dayton Rogers Manufacturing Company offers its newly developed Pneumatic Booster Pump. Working on the differential-area principle, it operates automatically and requires no power other than the air whose pressure is to be boosted. With input air at 95 psi it will raise the pressure in a 12-gallon receiver precharged at 100 psi to 185 psi in one minute, the



manufacturer states. The unit can be regulated to supply air at any pressure between the input pressure and twice that figure. The pump and all necessary valves, air-line filter, lubricator, and input and output gauges are mounted as a packaged unit on a base plate.

Circle 23E on reply card

Most standard hardness-testing methods are unsuitable for small or highly finished parts because the diamond or steel-point impressions often ruin the work. To avoid this loss, George Scherr Company, Inc., has introduced an instrument that is said to make marks that do not mar the finish. It is of the portable bench type and includes a microscope of 400 magnifications. The latter is swung directly over the impression to read hardness by measuring in 0.0005 millimeter (half a micron) with a reticule scale and vernier. Coarse Brinnel-ball impressions also may be measured, thus making the tool more useful for general optical work in shop or laboratory.

Circle 24E on reply card

QUOTES

—FROM HERE AND THERE

Slab Bolted to Rock Wall

"Rock bolts have been used to anchor a 20-ft. slab of rock which could threaten the valve house of the towering Hoover Dam in Nevada.

"The 180-ft. by 115-ft. slab is immediately above the valve house on the sheer canyon wall. Some thought was given to scaling off the rock, but it was decided that anchoring the rock by means of 350 two-in. wide steel bars, up to 33 ft. long, would be cheaper. The bars are inserted into drill holes and then grouted.

"Bureau of Reclamation authorities said the anchoring task was necessary because of earth tremors in the area. The tremors, it is believed, are caused by changes in the weight of Lake Mead formed by water impounded behind Hoover Dam."

Mining Congress Journal, April

Pneumatics Laboratory

"Recent trends toward high-altitude flight and more efficient utilization of weight and space in aircraft have led to a much wider application of pneumatic systems for performing such high-speed operations as extending and retracting the landing gear, emergency canopy or seat ejection, gun charging, and rocket ejection. To further the development and technical evaluation of pneumatic systems and equipment, the National Bureau of Standards, with the coöperation of the Bureau of Aeronautics, has established a pneumatics laboratory equipped with high-pressure, high-capacity facilities. The new laboratory has developed instrumentation to study the pneumatics of high-pressure, short-duration transient flow and is now engaged in the technical evaluation of airborne pneumatic systems and individual components such as actuator pressure reducers, special-purpose valves, storage reservoirs, and other related equipment. Parallel theoretical and experimental investigations are also being conducted on the physics of phenomena associated with the thermodynamics and mechanics of fluid flow."

From a summary of a Technical Report, National Bureau of Standards

Air Agitation

"Air or other gases can be bubbled or blasted through a liquid to create turbulence. Preferably, air is used when needed for chemical reaction, or as an aid for mechanical mixing to reduce power requirements. Also it is used with paddle agitation to help create currents initially started by paddle action.

"Sometimes air agitation is used simply because there happens to be excess compressor capacity. Or it may be that the initial piping installation appears cheaper than the purchase of a

MOST PRACTICAL
UNIT PILLOW BLOCK YOU CAN BUY

Let your SKF *Authorized Distributor* show you the "SY" Unit Pillow Block—the *one* that offers *all* the easy-maintenance features you've wished for.

BEST BEARING SEAL MADE
SKF Red-Seal, made of DuPont "Fairprene," with friction-free wiping contact in grooved inner race. The contact seal will release excess grease without popping out.

ROTATING FLINGER
slightly overlapped by outer race, works in conjunction with seal to form a labyrinth that effectively excludes dirt.

EASY TO MOUNT
on standard shafting. Just *slide* unit on shaft to proper location, and tighten 2 set screws. Tests prove this locking device withstands vibration. Spherical outer ring compensates for initial misalignment.

INTERCHANGEABLE
The "SY" Unit Pillow Block is interchangeable with existing installations by bolt hole spacing and center height features.

ALEMITE FITTING FOR RE-LUBRICATION
Note: Also available—the "FY" Flanged Mounting—same bearing unit but with housing that mounts on surface perpendicular to shaft . . and the Single Row, Ball Bearing Aligning Unit that can be installed in many kinds of housings.

Action

This coupon will bring you Bulletin 370, with complete description, dimensional tables, available sizes, weights, etc.

7351

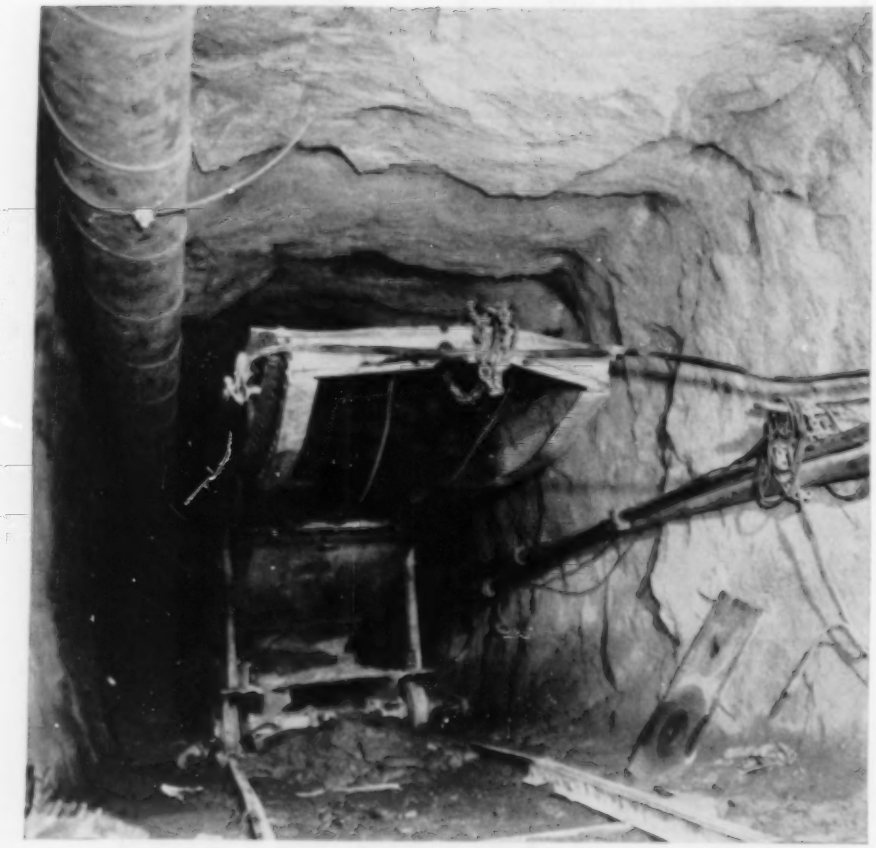
SKF®
BEARINGS AND PILLOW BLOCKS

SKF INDUSTRIES, INC.
Manufacturers of SKF *and* HESS-BRIGHT® *bearings.*
FRONT ST. & ERIE AVE. PHILADELPHIA 32, PA.
Send Bulletin 370. I'm interested in Pillow Blocks

for_____
(specify)
*Name*_____ *Title*_____
*Company*_____
*Address*_____
*City*_____ *Zone*____ *State*_____
*Type of plant*_____
*Approx. number Pillow Blocks in service*_____

Circle 25A on reply card

A MAJOR NEED FOR MINERS



Nothing is more important in underground operations than a dependable supply of fresh air. And nothing is more dependable in this service than Naylor lightweight pipe. Built with the exclusive lockseamed-spiralwelded truss, Naylor provides the added collapse strength and safety for push-pull ventilating service. It's easy to handle and install,—easy to extend as work progresses, particularly with the Naylor one-piece Wedge-Lock coupling to speed connections and simplify the job. Better check up on this pipe and coupling combination and find out how much it can do for you. Write for Bulletins No. 507 and No. 514.

NAYLOR PIPE

Naylor Pipe Company • 1245 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Circle 26A on reply card

mechanical mixer with accessory electric wiring and controls . . . . It (air) fills a real need in applications such as corrosive liquid jobs, fluidizing high-percent-solids slurries, or agitating very shallow vessels where mechanical mixing is impractical.

"Mixing action by a stream of bubbles is haphazard. Released from a nozzle at the bottom of a vessel, the bubbles take a direct vertical route to the surface of the liquid. Very little side-to-side displacement takes place. By contrast, air blasts can be directed. They behave like jets and improve mixing action by entrainment."

From an article on mixing by C. S. QUILLEN *in Chemical Engineering, June, 1954.*

Easy Way

"Percy Enefer, an employee of the British Columbia Electric Company, was awarded $100 for a method to speed underground cable work. When stringing cable through long pipe sections, he attaches a small canvas bag to a long wire and inserts the bag into the conduit. Enefer then introduces compressed air into the pipe behind the bag and blows it through, pulling the wire as it goes along. Flexibility of the bag permits it to pass obstructions."

From JOB TALK *in Construction Methods, May, 1954*

Safety at Work

". . . A quarter of a century without a time-losing injury was achieved today (July 1) by employees of du Pont's Rubber Laboratory, Deepwater Point, N.J., who proved themselves 90 times safer on the job than the average American in his 'away-from-work' time . . . . If the laboratory, with an average employment of 72 men and women during its 25 years of operation, had followed the nation's safety pattern, 90 serious injuries or deaths would have been expected. Since the day it opened, the laboratory has operated more than 3,200,000 man-hours without a time-losing injury—this despite such potential laboratory hazards as high-pressure steam equipment, acids, flammable liquids, fumes and wringer-type machinery."

From a du Pont news release

Product Revived

"John J. Hughes, manager of the stationery department of Buton & Skinner Printing and Stationery Co., St. Louis, tells in a recent article (*Modern Stationer*, May, 1954) about a glycerine finger moistener that was a 'real, genuine sleeper.' He says that his store sold 'gross after gross' of this product—'solidified glycerine in wax poured into a clear plastic case'—to banks and business establishments, and that the product is now catching on as an aid to easy shuffling and dealing of playing cards."

Glycerine Facts, June 15, 1954

Industrial Literature

The entire line of Lattice Braid rod and shaft packing patented by The Garlock Packing Company is described in Bulletin A-131 which is obtainable upon request.

Circle 25E on reply card

Motor starters with short-circuit protection for 2200-5000 volt drives are described and illustrated in Booklet 1062 offered by The Electric Controller & Manufacturing Company.

Circle 26E on reply card

Selection of proper pitch diameters for all American or unified thread plug or ring gauges is facilitated by The Sheffield Corporation's new slide-rule gauge selector obtainable upon request from the company's Gauge Division, Dayton 1, Ohio.

Stack-type pneumatic controllers for process variables are described and illustrated in Fischer & Porter Company's Catalogue 53-10 which also includes a selection guide based on controller response action.

Circle 27E on reply card

A guide book on fluorescent lighting has been prepared by Sylvania Electric Products Incorporated primarily for commercial and industrial users who are more concerned with practical results than with technical details.

Circle 28E on reply card

A bulletin offered by Sprague Engineering & Sales Corporation describes its S-216-C series of air-driven hydraulic pumps for high-pressure, low-volume service such as hydrostatic testing and for use with hydraulic presses, etc.

Circle 29E on reply card

Anyone concerned with building construction and maintenance may be interested in The Tremco Manufacturing Company's *Quick Reference Guide* which deals with the various problems involved and lists products made by it for the purpose.

Circle 30E on reply card

Homestead Valve Manufacturing Company offers a 24-page reference book, No. 39-5, giving full information about its full-port and venturi-type lubricated plug valves in sizes up to 14 inches. Illustrations of typical installations are included.

Circle 31E on reply card

In a 14-page brochure, Armour Research Foundation of the Illinois Institute of Technology summarizes its extensive facilities for every phase of metals research and the services the department with its staff of 115 technicians, engineers and scientists offers private industry.

Circle 32E on reply card

Eclipse Fuel Engineering Company is offering a bulletin—M-500—dealing with the design and performance characteristics of its entire line of diaphragm-operated solenoid valves in pipe sizes from $\frac{3}{8}$ to $1\frac{1}{2}$ inches. Data includes tables of aid in selecting valves for varying pressure ranges.

Circle 33E on reply card

Booklet No. 850 released by Robinson Aviation, Inc., describes a new method of vibration and shock control based on the use of Met-L-Flex, a resilient cushion of knitted metal wire. Examples of industrial mounts for precision instruments as well as massive machinery are described and illustrated.

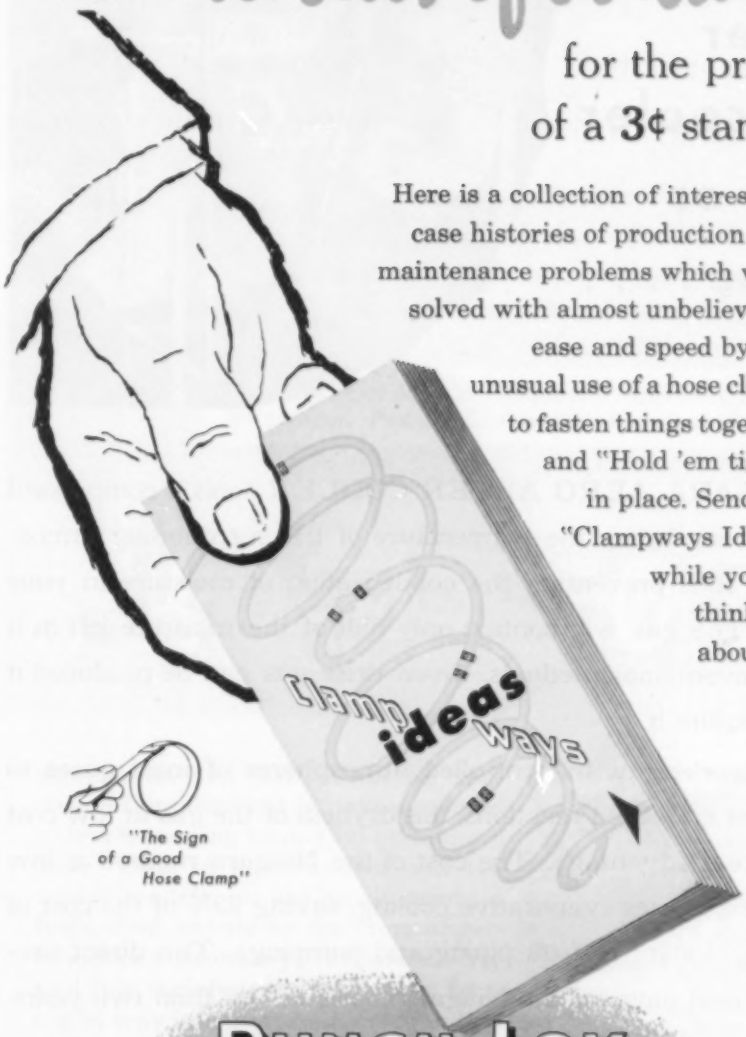
Circle 34E on reply card

ideas...worth

hundreds of dollars

for the price of a 3¢ stamp

Here is a collection of interesting case histories of production and maintenance problems which were solved with almost unbelievable ease and speed by the unusual use of a hose clamp to fasten things together and "Hold 'em tight" in place. Send for "Clampways Ideas" while you're thinking about it.*



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Chicago 7, Illinois

send me Clampways ideas FREE

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My Name _____ Title _____

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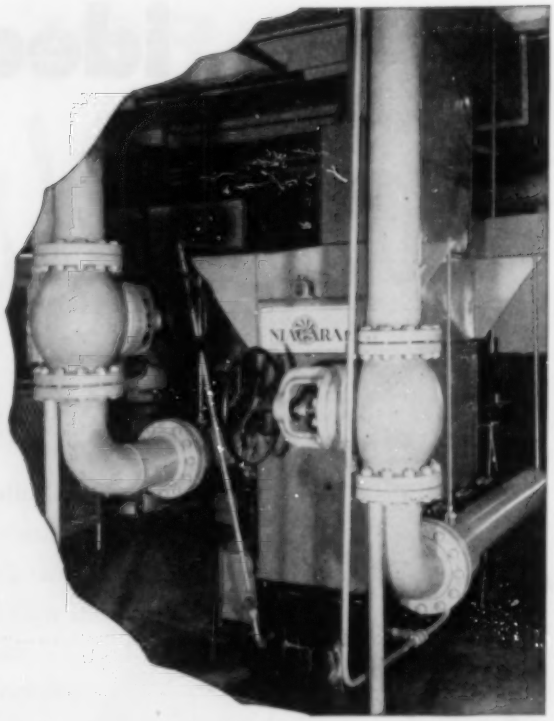
4800

Circle 27A on reply card

How to get drier or cooler air or gases . . .



NIAGARA AERO AFTER COOLER cools a compressed gas, or air, below the temperature of the surrounding atmosphere, thus preventing the condensation of moisture in your lines. The gas will contain only half of the moisture left in it by conventional methods. Even drier gas can be produced if you require it.

In working with controlled atmospheres of inert gases to prevent undesired reactions, this dryness of the gas at low cost is a great advantage. The cost of the Niagara method is low because it uses evaporative cooling, saving 95% of the cost of cooling water (and its piping and pumping). This direct saving of cost pays for the Niagara cooler in less than two years.

If you use compressed air to operate tools or pneumatic equipment you save much in water and oil damage to tools and equipment, and in water damage to materials by using the Niagara Aero After Cooler.

Write for a bulletin, or ask nearest Niagara Field Engineer if you have a problem involving the industrial use of air.

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

Dept. CA , 405 Lexington Ave. New York 17, N. Y.

Experienced Field Engineers in Principal Cities of U. S. and Canada

Circle 28A on reply card

The Permutit Company has announced a 12-page bulletin, No. 2391A, which describes its automatic continuous blowoff equipment designed to meet the demands of modern boilers. Four typical arrangements are discussed and illustrated.

Circle 35E on reply card

Specifications and other engineering data on crane runway rails and accessories such as rail clips, stops, bolts and bearing plates are contained in a release made available by L.B. Foster Company, which specializes in equipment of this type.

Circle 36E on reply card

Bulletin B-2102 published by Reliance Electric & Engineering Company and entitled *Motor Selector* contains all the information one should have on its squirrel-cage induction motors in the 1- to 200-hp range to pick the right one for a given job.

Circle 37E on reply card

Instrumentation for Steam Generation is the title of a bulletin (9050) being distributed by Minneapolis-Honeywell Regulator Company. A 28-page reference book, it should be of aid to plant engineers in selecting instruments for general use in boiler plants.

Circle 38E on reply card

Kleer-Stream automatic oil recovery units designed for use with parts washers, coolant sumps and reservoirs handling liquids containing oil are described in Bulletin KS-54 which may be procured from the Pioneer Pump Division of Detroit Harvester Company.

Circle 39E on reply card

Bulletin No. 654 issued by The Winslow Company describes its Truetemp Input Controller, an instrument that may be added to any existing "on-off" thermocouple-actuated temperature control system to maintain furnace or heating temperature within 0.2°F plus or minus.

Circle 40E on reply card

Set Screw & Manufacturing Company has released Catalogue No. 19 dealing exclusively with its conventional and self-locking set screws. The 24-page book includes general information, technical data and a preview of special types soon to be put on the market.

Circle 41E on reply card

Chicago Wheel & Manufacturing Company has issued a plastic-bound reference book describing its line of grinding wheels, Flex wheels and break-resistant cut-off wheels. Also included are tables giving their proper operating speeds and information on accessories for small hand grinders.

Circle 42E on reply card

Catalogue 4G offered by Barksdale Valves is of value to engineers concerned with pneumatic or hydraulic controls. The manual describes and illustrates the Shear-Seal principle and tells how it is applied to manual and solenoid valves. A pressure-switch selection chart based on users' requirements is included.

Circle 43E on reply card

The V.D. Anderson Company has revised its catalogue, *Solving Steam Trap Problems*, to include information on its new combination float and thermostatic traps which are said to vent air much faster than standard inverted bucket traps. The 36-page book, prepared as a guide to steam-trap users, tells how to calculate condensation loads, to select types for varying classes of equipment, and gives pointers on how to install and service traps.

Circle 44E on reply card

A revised edition of its general catalogue on measuring and control equipment for liquids and gases has been published by Simplex Valve & Meter Company especially with operating and supervisory plant personnel in mind. The 36-page book covers its complete line of controllers, gauges, manometers, meters, valves, Venturi tubes, etc., for water and sewage works and power and processing industries. Each product is fully described and illustrated.

Circle 45E on reply card

A booklet that should prove of interest especially to engineers and executives in the electric-power field has been prepared for distribution by Aluminum Company of America. It traces Alcoa's research and progress in aluminum conductors, enters into special engineering work done in connection with vibration and sag, illustrates outstanding installations and includes a bibliography of its technical reference material on the subject.

Circle 46E on reply card

An article entitled *Outdoor Water-Vapor Refrigeration System* that originally appeared in COMPRESSED AIR MAGAZINE has been made available in reprint form by Ingersoll-Rand Company. Written in nontechnical language, it deals with one of the largest units of its kind in service and explains why steam-jet water-vapor refrigeration is gaining in popularity. Engineers whose responsibility it is to provide plant utilities should find the reprint of interest.

Circle 47E on reply card

Continuous-cast bearing bronze (SAE 660) for maintenance, repair and production purposes is the subject of a bulletin obtainable from the American Smelting & Refining Company. In addition to describing the patented process by which varying bronze alloys are cast into rods, tubes and shapes of different diameters and profiles (products formerly available only as foundry castings), it enters into the metallurgical characteristics of Asarcon 773 and gives five reasons why it pays to use it.

Circle 48E on reply card

Mallory-Sharon Titanium Corporation has released a booklet that gives the physical properties, forging temperatures, impact and fatigue strength, and the thermal stability of its 3A1-5Cr, a double-melted titanium-base alloy developed especially for bar and forging applications. The material is available in billet, bar, rod, forging, extrusion or plate form.

Circle 49E on reply card

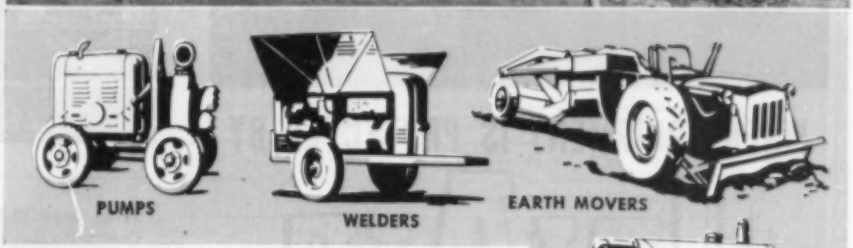
Air Reduction Sales Company has made available a 16-page catalogue—ADC 709B—on its Heliweld or tungsten-arc welding process that makes use of inert helium or argon to shield welds from contamination by the atmosphere. It is used effectively on light gauges of metals and alloys that are hard to join. Actual welding operations are fully described, as well as the equipment and accessories required.

Circle 50E on reply card

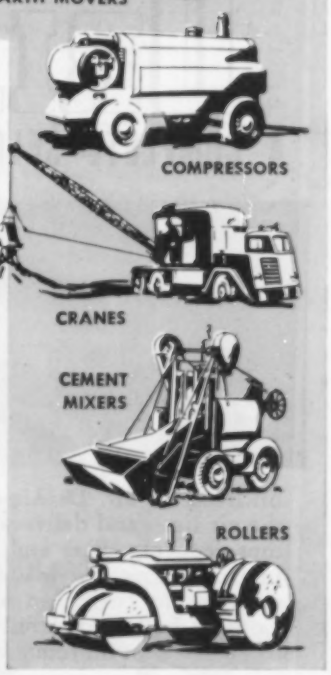
ASC-1 thermostat metal strip and fabricated bimetal elements made by American Silver Company, Inc., for use in automotive, electrical, heating, appliance, instrument and control fields are described in Technical Data Sheet No. 400. Also included are tables, charts and formulas of aid to designers in fashioning thermostat metal elements, as well as dimensional and chemical analysis ranges and tolerances to serve as references in establishing purchasing, inspection and quality control procedures.

Circle 51E on reply card

Ingersoll-Rand GR-105 compressor, operating backfill tamper. Power—Continental Red Seal F-162.



Continental Red Seal power for specialized applications is now available at levels ranging from 2 hp up to more than 1,000, in liquid-cooled and air-cooled models, for use on all standard fuels. And, strictly on the score of *performance*—economy, dependability and low maintenance cost—it is finding its way into more and more leading makes of specialized machines. The equipment builder's good name, and the end-user's satisfaction, are double-clinched by this fact: EVERY CONTINENTAL RED SEAL IS NOT ONLY BUILT FOR ITS JOB, BUT BACKED BY PARTS AND SERVICE FACILITIES COAST TO COAST.



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CONTINENTAL MOTORS® Powerful as the Nation AMERICA'S STANDARD

1819 BROADWAY, NEW YORK 23, NEW YORK • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
6210 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA.
1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Continental Motors Corporation
MUSKEGON, MICHIGAN

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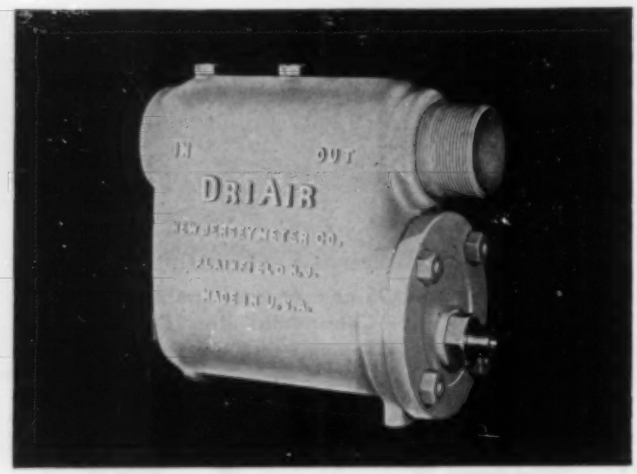
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT

DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

Circle 30A on reply card

LOGAN AIR AND HYDRAULIC POWER

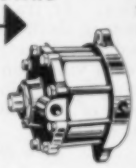
SPEEDS • COORDINATES • REFINES PRODUCTION
IN OVER 10,000 INDUSTRIAL PLANTS

AIR-DRAULIC CYLINDERS • AIR and HYDRAULIC PRESSES • COLLET GRIP TUBE FITTINGS • SURE-FLOW COOLANT PUMPS • HYDRAULIC POWER UNITS • HYDRAULIC CYLINDERS • HYDRAULIC CONTROL VALVES • AIR CHUCKS • AIR CONTROL VALVES • AIR CYLINDERS •

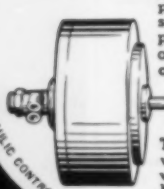
Logan

ROTATING AND NONROTATING **AIR CYLINDERS**

NONROTATING—7 STANDARD MOUNTING TYPES



Standard sizes from 1½" to 16" bore; maximum stroke, 18". Special models to meet your requirements. Logan features larger ports, sturdier construction, maximum power without leakage, permanent seal around piston rod.



ROTATING

Two standard styles—Type R with cast iron body; Type K with lightweight aluminum body. Bore 1½" to 20" stroke 1" to 2". Longer strokes special.

SAVES TIME Logan AIR AND HYDRAULIC EQUIPMENT EXPORT-MOTOR

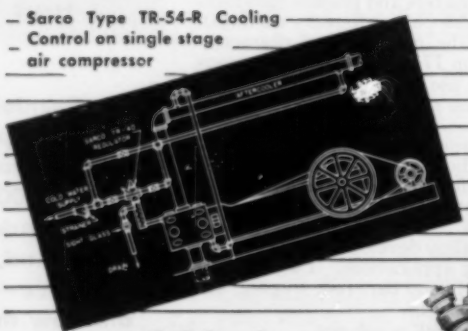
LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS • CATALOG ON REQUEST

Consult Logan for your Special Heavy-Duty, Mill-Type Cylinder requirements.

LOGANSPORT MACHINE CO., INC.
846 Center Avenue Logansport, Indiana

Circle 31A on reply card

— Sarco Type TR-54-R Cooling Control on single stage air compressor



Sarco TR-54-R

efficient COMPRESSOR COOLING

- Do you want to avoid over — or under — cooling?
- Do you want to save cooling water and lubricants?
- Do you want to increase the efficiency and life of your air compressor? . . . then install SARCO COOLING CONTROLS

Simple • Self-operated • Inexpensive

Ask for Bulletin No. 701

SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.
Represented in Principal Cities
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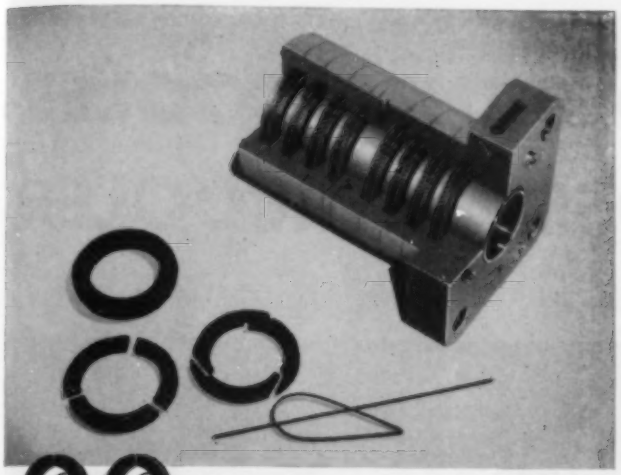

Look to COOK for Better CARBON PACKING RINGS!

Cook carbon packing rings are made of a special carbon graphite material that automatically assures you *high resistance to wear, chemical inertness and excellent heat conductivity.*

If you have sealing requirements for non-lubricated compressors, write today for a sample carbon ring, plus literature on Cook's complete line of packing materials. Address C. Lee Cook Manufacturing Co., 916 South Eighth Street, Louisville 3, Ky.

C. LEE COOK MANUFACTURING CO.

Sealing Pressures Since 1888

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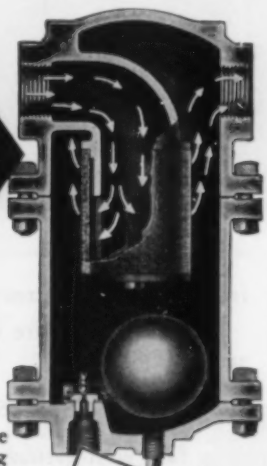
NO MOISTURE OR DIRT GETS BY HERE



Johnson Self-Draining Compressed Air Separator.....

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. Controlled expansion of air in separator precipitates most of the moisture.
2. A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.

Johnson Separation Devices include Separators for Compressed Air or Steam, After coolers, oil absorbers.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

WRITE FOR CATALOG

The Johnson Corporation

830 WOOD STREET — THREE RIVERS, MICH.

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Now in its 6th year

NOPAK Shelf-Stock Service...

based on these 2 Standard Mounting, Class 1, Cushioned Cylinders

LIST PRICES F.O.B. Milwaukee, Wisconsin — Subject to Revision.

Cyl. Dia. Bore	STOCK STROKE LENGTHS — All Double Acting								
	1"	2"	3"	4"	6"	8"	10"	12"	15"
1½"	24.16	25.72	26.08	26.44	27.16	27.88	28.60	29.32	30.40
2"	26.24	27.88	28.32	28.76	29.64	30.52	31.40	32.28	33.60
2½"	32.36	34.12	34.68	35.24	36.36	37.48	38.60	39.72	41.40
3"	35.04	37.28	37.92	38.56	39.84	41.12	42.40	43.68	45.60
4"	40.84	43.68	44.52	45.36	47.04	48.72	50.40	52.08	54.60
4½"	48.96	51.92	52.88	53.84	55.76	57.68	59.60	61.52	64.40
6"	66.60	70.80	72.20	73.60	76.40	79.20	82.00	84.80	89.00
8"	.....	126.80	129.20	131.60	136.40	141.20	146.00	150.80	158.00

By specifying NOPAK Shelf-stock, you buy *quality cylinders* at lowest prevailing prices, you *eliminate waiting* for "specials", reduce engineering costs. Compare the prices and scope of NOPAK Shelf-stock (1½ x 1" to 8 x 15") with competitive offerings — and you *will specify* NOPAK.

● Basic mountings "A" or "E" convertible to "B", "C", "D" or "F", (see below) by changing cylinder heads. Add 10% to above prices (no extra charge 8" bore). ● Piston Rods NF male thread. ● Cushioning can be eliminated on rod, blank or both ends by removing spring and ball-check.

NOPAK 4-Way Valves, hand, foot, solenoid, or pilot operated, to actuate all cylinders, *also in Shelf-stock.*

GALLAND-HENNING NOPAK
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NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

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A 8003-½-R

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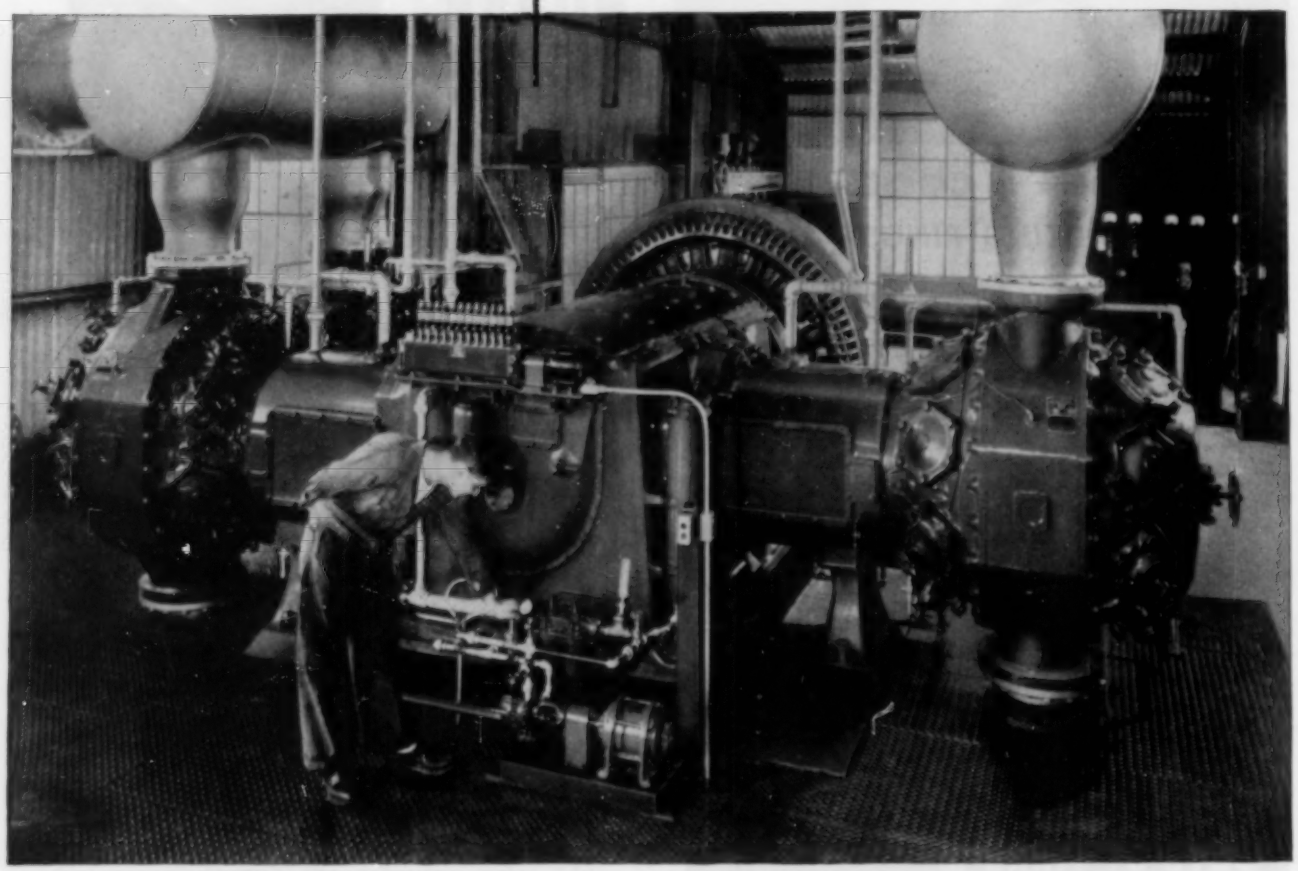
for the vital processing of antibiotics this air compressor is equipped with

ROSS INTERCOOLER
ROSS AFTERCOOLER



Providing a continuous supply of air for the production of urgently needed antibiotics, this leading make compressor has been in virtually constant 24-hour-a-day operation since installation over a year ago. Because moist air or air failure could well be disastrous in the processing of costly terramycin, this compressor has been equipped for utmost dependability. A Ross Intercooler and a Ross Aftercooler assure cool, dry air *at all times.*

Unsurpassed for ruggedness and high thermal efficiency, Ross Intercoolers, Aftercoolers and Lube Oil Coolers are regularly selected by numerous compressor builders and users. Another reason: prompt availability of standardized designs and sizes to fulfill most needs.

Detailed literature will be mailed on request. Write.

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why New DIEHL Type "D" Motors *are your best motor buy...*

These desired characteristics are inherent in the NEW DIEHL TYPE "D" MOTORS

STATOR INSULATION is doubled in dielectric strength and exceptionally resistant to moisture, oil, chemicals and abrasion.

LEADS are specially insulated, last longer. Occupy less space. Permanently numbered to save wiring time.

BALL BEARINGS are oversize to provide excess load capacity. Pre-lubricated for years of trouble-free service.

INDESTRUCTIBLE ALUMINUM ROTORS. Keyed to the shafts in most frame sizes to prevent looseness under unusual and severe load conditions.

These, *and many other features*, backed by 68 years of motor-building experience, make Diehl Motors *your* best motor buy. We will welcome an opportunity to provide detailed information on Diehl Motors to meet your specific requirements.

Former N.E.M.A. Standard frame sizes still available for interchange and replacement.

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GYRO-FLO
ROTARY COMPRESSORS

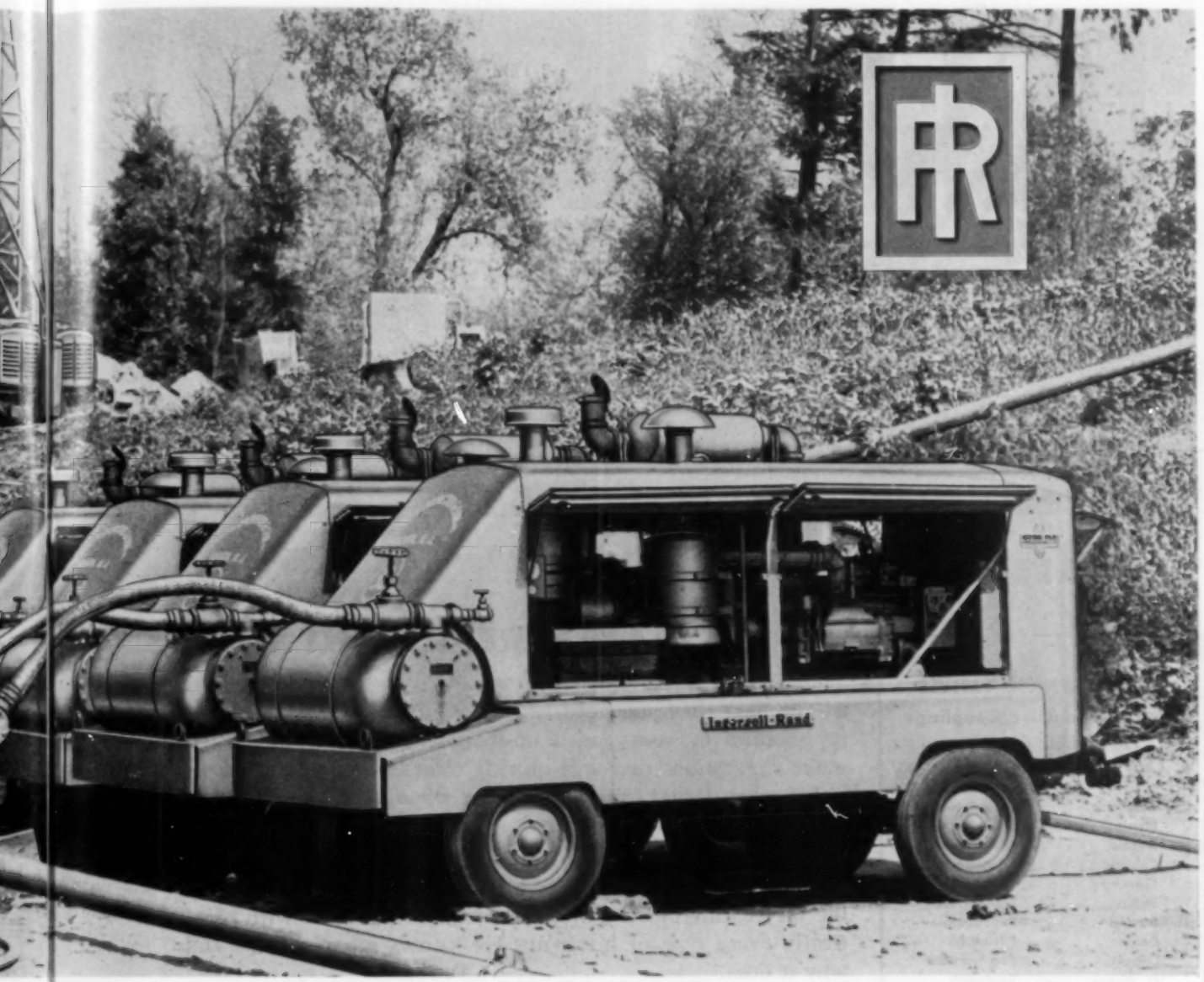
117 units speed construction of the New York Thruway

These four 600 cfm **GYRO-FLO** portables supply ample air power for operating up to eleven I-R wagon drills on one section of the New York Thruway. Air from a common receiver is piped 700 to 800 feet to the drilling site through a 6" line. In the background is a completely self-contained I-R Quarrymaster for sinking large, deep blast holes.

Here, an I-R **GYRO-FLO** supplies abundant air for operating a pneumatic pile hammer, driving sheet piling for construction of one of the Thruway's many bridges.

The **GYRO-FLO** compressor has repeatedly proved its ability to operate continuously under all types of working conditions, with a trouble-free dependability and easy portability heretofore not obtainable in any portable air compressor.

These compressors furnish air to users of 173 Ingersoll-Rand Type FM Wagon Drills—more than 70% of the total wagon drills on this project.



By early 1955, you'll be able to drive from New York City to Buffalo—without a single traffic light or stop sign. That's the fabulous New York Thruway, a dream that I-R Air Power is helping to carve out of rugged terrain where many sections are solid rock.

One hundred seventeen GYRO-FLO rotary compressors, with a combined capacity of 61,265 cubic feet of air per minute, are speeding the job to completion—driving Ingersoll-Rand rock drills and other pneumatic equipment on this high-speed construction project.

Here, where sustained drilling speed and uninterrupted production are of particular urgency, the simplicity and dependability of the GYRO-FLO design really pay off. The GYRO-FLO rotary sliding vane compressor has no valves, pistons, rings, rods or clutches to wear out, adjust or replace. It delivers an abundant supply of oil-free air at temperatures that never go above 200 F. And pressure is automatically controlled closely and smoothly all the way from 0 to 100% capacity.

Available in 125, 210, 315 and 600 cfm, GYRO-FLO offers the only complete line of rotary portables—each size proven by years of heavy duty in the field. Get the complete GYRO-FLO story from your nearest Ingersoll-Rand distributor or branch office. It will save you money now and for many years to come.

2-94

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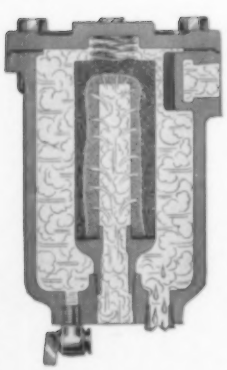
ADAMS HAS BOTH*

– Both Answers to the Problem of Keeping Water, Water Vapor, Oil and Dirt out of Compressed Air Lines.

There's no **one** answer to this problem! The most expensive aftercooler you can buy will not remove scale that is picked up in the distribution lines. The most expensive air filter you can buy cannot guarantee removal of water vapor until it has been condensed by cooling. That's why Adams makes both.



*PORO-STONE AIR FILTER

1. Centrifugal separation of dirt and liquids.
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